Pós-Graduação em Ciência da Computação

Suzana Cândido de Barros Sampaio

AN APPROACH FOR ANALYSIS AND UNDERSTANDING OF THE SOFTWARE PROJECT ACTUALITY

Ph.D. Thesis

Federal University of Pernambuco
posgraduacao@cin.ufpe.br
www.cin.ufpe.br/~posgraduacao

RECIFE
2015

Suzana Cândido de Barros Sampaio

AN APPROACH FOR ANALYSIS AND UNDERSTANDING OF THE SOFTWARE PROJECT ACTUALITY

Ph.D. Thesis presented to the Center for Informatics of Federal University of Pernambuco in partial fulfillment of the requirements for the degree of Philosophy Doctor in Computer Science.

Advisor: *Hermano Perrelli de Moura*

RECIFE
2015

Catalogação na fonte
Bibliotecário Jefferson Luiz Alves Nazareno CRB4-1758

S192a Sampaio, Suzana Cândido de Barros.
An approach for analysis and understanding of the software Project actuality / Suzana Cândido de Barros Sampaio. – Recife: O Autor, 2015.
248 f.: fig., tab.

Orientador: Hermano Perrelli de Moura.
Tese (Doutorado) – Universidade Federal de Pernambuco. CIn, Ciência da Computação, 2015.
Inclui referências e apêndice.

1. Engenharia de software- Gerência. 2. Realidade de projetos de software. I. Moura, Hermano Perrelli. (Orientador). II. Titulo.

005.1 CDD (22. ed.) UFPE-MEI 2015-129

Tese de doutorado apresentada por **Suzana Cândido de Barros Sampaio** ao programa de Pós-Graduação em Ciência da Computação do Centro de Informática da Universidade Federal de Pernambuco, sob o título **An Approach for Analysis and Understanding of the Software Project Actuality**, orientada pelo **Prof. Hermano Perrelli de Moura** e aprovada pela banca examinadora formada pelos professores:

Prof. Alex Sandro Gomes
Centro de Informática/UFPE

Prof. Alexandre Marcos Lins de Vasconselos
Centro de Informática/UFPE

Prof. Sheila dos Santos Reinehr
Pontifícia Universidade Católica do Paraná/PUCPR

Prof. Adriano Bessa Albuquerque
Universidade de Fortaleza/UNIFOR

Prof. Telma Lúcia de Andrade Lima
Universidade Federal Rural de Pernambuco/UFRPE

RECIFE
2015

I dedicate this thesis to God for giving me the strength to keep on moving, the love for my research, and my support system: my husband Mauro, my mother Ester and my kids.

Acknowledgements

First of all, I would like to thank God, for standing by me helping maintain the focus, the power and faith along this journey. Moreover, allowing me to see that we only succeed in what we love, and making it possible loving this work and its results.

To my husband, Mauro Silva, for encouraging me during the journey and supporting me in every moment, by being a mother for our children since I was not available to be one, with words of motivation, or even abdicating of his free time to help me with configuration management, latex, mindmaps and others. His support was without any doubt, the most relevant piece for the thesis's conclusion.

To my kids, Leticia and Rafael for all inspiration, motivation and will to be a better person, mother, spouse, daughter, sister, friend, professional and researcher.

To my mother Ester, our safe haven, and my father Carlos for his example, for their love and guidance along my life and for the affection and prayers to God in my favor.

To my family, especially to my sister Fernanda Sampaio for the revisions and dreams, my friend-sister Waleska Rolim for the support, mother-in-law Fatita for her love and prayer, my sister-in-law Aletheia to reminding me that this journey could be done, and all others loved ones for the affection and prayers to God in my favor. To my close friends Fabiana Leonel, Lilian do Vale, Luiz Sergio, Rafael Medeiros and Maria Jose (Zeza) for the encouragement and love.

To my research brother and partner Marcelo Marinho and the others members from Gpito research group Alexandre Luna, Wylliams Santos, Robson Godoy and Adson Cunha.

To my friend Ivaldir Júnior for the partnership, reviews and everyday friendship. And to the other friends from SoftexRecife Marcos Gomes, Marcelo Clemente and Vitor Costa. Thank you for the opportunity, the connections, the patience and support.

To my supervisor, Hermano Perrelli de Moura, for the opportunity, advices, critics and suggestions during this period.

To the professors Sheila Reinehr, Andreia Malucelle and their research group "Grupo de Pesquisa em Engenharia de Software" from PUCPR to so kindly open their door to me and giving me such outstanding contribution.

To professors Kathryn Cormican, Adriano Bessa and Alex Sandro Gomes for the contribution along the journey.

To the professors Adriano Bessa, Alexandre Vasconcelos, Alex Sandro Gomes, Sheila Reinehr dos Santos and Telma Lima for participating in the examination of my doctoral thesis.

I would like to thank all those who participated in our research, specially the entrepreneurs that open their doors to us. And their teams that engaged in research with me.

My special thank you for all the those who were not listed but still contributed with my journey.

The illiterate of the 21st century will not be those who cannot read and write,
but those who cannot learn, unlearn, and relearn.

—ALVIN TOFFLER

Resumo

Atualmente estudos confirmam que mudanças continuam a ocorrer na gestão de projetos tanto no ambiente acadêmico quando no profissional. Cada vez mais, as organizações usam projetos para atingir seus objetivos de negócios. Mesmo assim, os resultados muitas vezes ficam aquém dos objetivos esperados. Apesar da gestão de projetos ter se tornado um processo de negócio tanto no nível estratégico quanto no operacional, ainda há muito o que entender sobre a realidade dos projetos em organizações de desenvolvimento de software. A "Realidade de Projetos" debutou na rede de pesquisa Project Management Rethinking (RPM) em 2006, que buscava repensar a gestão de projetos. Para compreender os desafios enfrentados por projetos de desenvolvimento de software nos dias de hoje, precisamos ir além da restrição tripla (custo, prazo e escopo) e o seu processo ou tecnologia envolvida. Para gerenciar projetos precisamos entender como os membros da equipe do projeto reagem à rotina diária, aos problemas, contexto, cultura organizacional, todo o fenômeno da realidade dos projetos. Teorias tradicionais usadas para compreender e explicar o mundo da gestão de projetos fazem diferentes suposições sobre a realidade dos projetos, o conhecimento científico, a ética, os valores e o contexto onde ocorre a gestão do projeto. O objetivo principal deste trabalho é criar uma abordagem para investigar, observar e analisar a realidade de projetos de software e para apoiar a reflexão da equipe do projeto. E ainda, através do uso da abordagem, dar visibilidade ao fenômeno da realidade de projetos em seis pequenas organizações de desenvolvimento de software. Mesmo que os resultados dependam do contexto, algumas causas, efeitos, fatores de perturbação percebidos e analisados podem ajudar na compreensão deste setor, além de apoiar pesquisadores e profissionais no repensar da gestão de projetos. Para atingir esse objetivo, uma pesquisa exploratória (ER) e uma revisão sistemática da literatura (SLR) foram realizadas sobre a realidade de projetos e como observá-la. Com base no conhecimento adquirido com a ER e a SLR, foi definida e refinada uma abordagem que nos permite observar, analisar e compreender a realidade dos projetos e seus contextos. Seis estudos de caso utilizando a abordagem foram conduzidos a fim de refinar a abordagem e explicar as questões críticas em torno da realidade na gestão de projetos de software em Micro e Pequenas Empresas (MPEs). A abordagem prevê também uma etapa de reflexão e intervenção, executada com apoio de pesquisa-ação, onde as equipes se engajam em reflexão e ações, a fim de evoluírem como projeto e organização, com base na realidade observada.

Palavras-chave: Realidade de projetos. Gestão de projetos. Pesquisa qualitativa. Pesquisa-ação.

Abstract

Nowadays studies confirm that changes continue to occur in project management in both the practitioner and research fields. Organizations increasingly use projects and project management discipline to achieve business objectives but results often fall short of goals. Although project management has become a core business process for many organizations at strategic and operational level, there is still much to understand about project actuality in software development organizations. Besides, much is written about how to manage projects, but too little on what really happens in *Project Actuality*. Project Actuality debut in the Rethinking Project Management (RPM) agenda in 2006 aiming at understanding what really happens at project context. This research intends to understand, explain and explore this phenomenon. In order to understand the challenges faced by software project nowadays, we have to go beyond the triple constant (effort, cost and scope), its processes and technology. In pursuance of project management we must understand team's context, routine, problems, organizational culture, the entire project actuality phenomenon. Traditional theories used to understand and explain the world of management make different assumptions about actuality, scientific knowledge, ethics, values and context. This research's main objective is to create an approach to investigate, observe and analyze software project actuality and to support team reflection and project rethinking, and by using the approach, unveil the findings of six small software development organizations. The finding will give visibility on project actuality in six organizations, its projects and teams. Even though the findings are context dependent, some causes, effects, disturbance factors can help the understanding of this sector and assist researches and practitioners to see new ways of thinking project management. In order to achieve that goal, an Exploratory Review (ER) and a Systematic Literature Review (SLR) were conducted on project actuality. Based on the knowledge acquired on the ER and SLR, an approach was defined and refined enabling us to observe, analyze and understand project actuality and its contexts. Six case studies using the approach were conducted in order to refine the approach and to explain the critical issues surrounding the actuality in software projects management in micro and small organizations. Action research helped the team to engage on reflection and action, in order to evolve as project and organization based on the project actuality observed.

Keywords: Project Actuality. Actuality of Projects. Project Management. Action Research. Qualitative Research.

List of Figures

List of Tables

List of Acronyms

ANT Actor Network Theory 88

CMM Capability Maturity Model 33

CMMI-DEV Capability Maturity Model Integration for Development 32

CMMI Capability Maturity Model Integration 34

DoD Department of Defense 19

ICB IPMA Competence Baseline 32

IPMA International Project Management Association 29

KPM *Kaikaku* Project Management 29

MPS.BR Melhoria de Processo do Software Brasileiro 34

MR-MPS-SW Model to Brazilian Process Improvement for software 32

MSEs Micro and Small Enterprises 23

OGC Office of Government Commerce 38

OPM3 Organizational Project Management Maturity Model 32

P2M Project an Program Management 32

PM Project Management 134

PMBOK Project Management Body of Knowledge Guide 25

PMI Project Management Institute 29

PO Product Owner 130

PRINCE Projects in Controlled Environments 37

RPM Rethinking Project Management 19

SCM Scrum Master 168

SEI Software Engineering Institute 33

SLR Systematic Literature Review 60

SME Small and Medium Enterprises 34

SPF Software Project Framework 21

TDD Test Driven Development 44

XP eXtreme Programming 43

Contents

1

Introduction

You don't think your way to a new way of living. You live your way to a new way of thinking.
-Henri J.M. Nouwen

1.1 Motivation and Context

In recent years, the world has been going through profound social, economic, political, and cultural transformation. The result is a competition intensification in the business environment. In this highly competitive environment, the urgency to adapt, to reinvent and to implement new strategies, new products and services have become a major advantage or even a requirement for business survival. Considering micro and small organizations, this aspect is especially critical.

One of the most important organizational developments has been the significant growth in project work across different sectors and industries (WINTER et al., 2006). Less than fifty years, project management was confined to U.S. Department of Defense (DoD) contractors and construction companies. Nowadays, the concept behind project management is being applied in several industries and organizations. Managing projects effectively is presented as a solution and, at the same time, as a great challenge in the current world. For that reason projects and project management are playing an increasingly important role in society and have become the subject of scientific research (KERZNER, 2013). Such great challenge is in place not only due to the competitive environment, but also because of the necessity of transforming project in organization success. With billions of dollars dependent upon the success and failure of projects, it is no wonder organizations are striving to manage projects more efficiently (PMI, 2013a).

Over the past 20 years, there has been a substantial improvement in the quality and rigor of research in project management (TURNER, 2010). Among the initiatives to expand and improve project management stands out a network named Rethinking Project Management (RPM). The network's rethinking concept was to research (WINTER et al., 2006):

- how published knowledge in project management should be enriched and extended with new concepts and approaches to support practitioners working on 21st century

projects;

- how to contribute to the development of the field beyond its current intellectual foundations, reflecting the need to re-examine in a constructive way the relationship between project management research and the field as practiced; and
- how current project management theories could be enriched and extended to enhance the relevance of the knowledge created in the research process for practical action in project environments.

The RPM research network studied seven core areas of concern. Among those areas, the research on project actuality and its urge to conduct a better understanding of project in practice, in its context. Actuality research arose from the RPM network, with the aim to understand what actually is in the arrangements labeled "project" over time (CICMIL et al., 2006). It seeks for a better understanding of project's actuality. Cicmil *et al.* also argued that project actuality encompasses the understanding of the lived experience of organizational members with work and life in their local project environments.

The research network results pointed to five major research areas (WINTER et al., 2006):

- complexity (multiple images)[1];
- social process (images that focus on social interaction among people and human action);
- a change in the focus from product creation to value creation as a prime focus;
- a broader conceptualization of projects (multiple purposes not always predefined); and
- reflective practice (reflective practitioners, who can learn, operate and adapt effectively in complex project environment).

Project actuality has a lot in common with these research areas. It is concerned with the multiple images of projects and its teams. It sees projects, from multiple perspectives, exploring the insights and implications of each action in each context. It involves multiple points of view on a chosen strategy or decision analysis, multiple motivations and different contexts and situations. Besides, project actuality is based on the social interactions and actions among teammates, managers and stakeholders involved.

After the RPM network initiative in 2006, there were many studies related or associated with project actuality (CICMIL et al., 2006; CICMIL, 2006; HODGSON; CICMIL, 2007; JAAFARI, 2007; AVRAM et al., 2008; MAANINEN-OLSSON; MÜLLERN, 2009; WINTER;

[1] Consciously seeing the projects from multiple perspectives. Such as social image, political image, development image, value creation image, organizational image, among others (WINTER; SZCZEPANEK, 2009).

SZCZEPANEK, 2009; WILLIAMS et al., 2010; LALONDE; BOURGAULT; FINDELI, 2012; POLLACK; COSTELLO; SANKARAN, 2013). However, up to 2014, there was no literature about how to analyze and observe software project actuality, specially related to small software development organization. Svetlana Cicmil is the most cited author on the project actuality definition and concept. Her work inspired many of the research on how to analyze project actuality, including this thesis. Even though, she did not present their findings or case studies on project actuality (CICMIL et al., 2006).

Many authors proposed processes, frameworks or approaches to study project actuality (JAAFARI, 2007; AVRAM et al., 2008; MAANINEN-OLSSON; MÜLLERN, 2009; WILLIAMS et al., 2010; LALONDE; BOURGAULT; FINDELI, 2012; POLLACK; COSTELLO; SANKARAN, 2013), however all of them analyzed large and complex engineering projects or large and complex public sector projects. Among those, we have:

- MAANINEN-OLSSON; MÜLLERN (2009) analyzed project actuality in a large industrial company in Sweden ;
- LALONDE; BOURGAULT; FINDELI (2012) proposed a framework to examine project management from the practice viewpoint, focusing on large scale architectural project with a budget over a billion dollars;
- JAAFARI (2007) presented a systematic approach to assess the health of large projects or programs at any point in their life;
- POLLACK; COSTELLO; SANKARAN (2013) proposed an Actor–Network Theory as a sense making framework for complex organization. Their research focused in large public sector projects at Australia;
- WILLIAMS et al. (2010) investigated public investment project governance frameworks in Norway and the UK.

Also aligned with the RPM agenda, years later MOURA (2012) proposed a framework to manage software projects based on the study of the evolution of project management thinking and professional experience. According to the author, the Software Project Framework (SPF) is also a framework for research, since its elements represent a new agenda for research in project management. The following principles guide the SPF: organizing, sense making, constructivism, reflective learning, singularity, critical thinking, integration and temporality. The SPF's dimensions are: Learning, Complexity, Knowledge, Uncertainty, Innovation, Leadership, Marketing, Methodology, Change, Politics, Simplicity, Social, Stakeholder and Value. The SPF has been a direction for all members of the Project Management Research Group (GP2)[2], at the Informatics Center (CIn) at Federal University of Pernambuco.

[2]The GP2 Project Management Research Group web site: http://gp2.cin.ufpe.br.

Among the disciplines and the research agenda, the SPF is consistent with the RPM proposal. Once again we have research directions pointed to social process, the focus on value creations and the complexity project's multiples images among others. Among the principles, this research inherits the reflective learning and critical thinking. Both principals used in the approach to observe and analyze project actuality.

Aligned with this context, this thesis presents an approach to analyze and understand projects and its actuality by reflecting about the broader conceptualization of multiples images and social concepts. By facing the project as our research field and by involving the practitioners into our research, we embraced the reflective practitioner in its actuality. By analyzing the lived experience and by understanding its actuality, this research intend to provide visibility of project actuality and contribute on enhancing organizational project management practices, with the help of a new approach suited to small software development organizations. In addition, with the project's team help as reflexive practitioners, overcome problems and trace improvements in six small organizations. Moreover, this research intends to help academy and practitioners on understanding what is really going on in the real project environment and contribute to project management development beyond its current intellectual foundations.

Project management has evolved over recent decades, since researchers and practitioners have attempted to identify what causes project failure and what factors lead to its success. But what is success? Success means different things for different people (JUGDEV; MÜLLER, 2005). For over twenty years the definition of project success was to perform an activity with time restriction, costs and performance (KERZNER, 2013). This work support a long time concept of success where it goes beyond these common aspects (PINTO; SLEVIN, 1998; MORRISON; BROWN, 2004; SHENHAR et al., 2001). The long term success idea focuses in organizational success through the project success, where the second one is something more immediate, as step to a bigger accomplishment. Real success is the one that provides organizational growth, such as contributing for launching a new product, gaining a strategic client, gain operational efficiency and increase their ability to deliver or achieving an organizational strategic goal.

In 2013, the Standish Group (GROUP, 2013) presented a special version of the Success Factors for Small Projects using their database and analytic tools, the CHAOS Manifesto (MANIFESTO, 2013). Among the success factors presented in the report, executive sponsorship is the number one factor. Some of the other factors are: optimization, skilled resources, project management expertise, agile process, and emotional maturity. This report reinforces what was presented by Barry Boehm more than 30 years ago about the importance of project management quality and expertise. BOEHM et al. (1981) has warned that poor management can increase the software cost faster than any other factor. The author points out that bad actions such as: lack of motivation environment; lack of roles definition; and gaps in the requirements specification are responsible for doubling the software development costs.

Since a project can be seen as a temporary organization (TURNER; MÜLLER, 2003; PACKENDORFF, 1995), it is useful to analyze the CHAOS Manifesto's results by the perspective

of small organizations. Although this work does not intend to study or define success, all factors by itself are a huge motivation to understand the actuality in small software organizations. It also motivated this work on defining software development operational work as project to be able to offer senior management visibility and control, as well as team's sense of success and accomplishment.

The CHAOS Manifesto result (MANIFESTO, 2013), and authors' findings along the decades (BOEHM et al., 1981; BOEHM, 1987; FARAJ; SPROULL, 2000; CHIANG; MOOKERJEE, 2004; SIMMONS, 2007) have pointed out the project management importance to ensure the project's productivity and success. But what are the techniques adopted in project management in small software development organizations? What are the references (models, body of knowledge and others) to micro and small sized companies regarding project management? What are the project management success techniques used? What are the managers expertise? How is the management structured? Projects and their management in micro and small sized organizations is a structure that should be investigated under the light of theoretical concepts. This becomes particularly relevant when considering some numbers related to this size of organization as follows.

Micro and Small Enterprises (MSEs) have a great importance in any country's socioeconomic scenario, and in Brazil it is not different. A research conducted by the Brazilian Institute of Geography and Statistics (IBGE) in 2010 showed that this kind of organization represents more than 99% (5.7 million) of Brazilian companies and they represent 60% of the jobs across the country. However, it represents no more than 20% (US 700 billion) of the gross domestic product (GDP[3]) (IBGE, 2010).

This work interprets these numbers, within this kind of organization as an excellent opportunity to help this country and its growth. In order to accomplish any results and make a difference in this scenario it is necessary to study those involved in it.

To achieve satisfactory results in researching the project actuality phenomenon in MSEs, it is essential to apply appropriate research strategies. A strategy for research in social sciences corresponds to a different way of collecting and analyzing evidences produced in specific contexts (YIN, 2014). This can stem from borrowing a methodology from other scientific domain (Social Sciences), where studies are usually described using a different way of communicating and exchanging thoughts (DOS SANTOS; TRAVASSOS; ZELKOWITZ, 2011).

Project management and software development are social processes, since they are based on a common understanding of those involved in the process (PFLEEGER, 1999). Seeing a software project as a temporary organization, helps us to understand the importance to see beyond the triple constraint (cost, schedule and scope), and the process and the technology involved. In order to manage temporary organizations we must understand how project team members react to their daily routine, problems, the entire project phenomenon and its context. The analysis must consider project aspects, and its management, such as organizational culture, project context,

[3]The total value of goods produced and services provided in a country during one year.

situation and status, team internal and external relations, their activities, among others. In order to investigate project phenomenon, it is necessary to idealize an approach to analyze all project factors and its actuality.

Qualitative research methodologies have become increasingly important modes of inquiry for the social sciences and applied fields, such as education, regional planning, health sciences, social work, community development, and management (MARSHALL; ROSSMAN, 2010). According to PATTON (2005), qualitative data consists in detailed situations, events, subject descriptions, interactions and observed behaviors; direct quotations from people about their experiences, attitudes, beliefs, and thoughts. It aims to explore, describe and explain real-world phenomena (RAGIN; AMOROSO, 2010).

In this research we adopted qualitative research to study exactly the variables pointed by Patton, where the results are expressed through categories that are distinguished by some non numeric characteristic or phenomena related to day to day software projects, such as project status, context, situations and actuality. Even though we consider some quantitative data as a classification of the sample, such as average years of experience, number of people on the team and others. Among the qualitative methods, case study was chosen to carry the investigations and to evaluate the approach.

YIN (2014) defines a case study as being an empirical inquiry method that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly defined. The author defines five components to a research project or sources of concern related to case studies. These include: (a) propositions (which may or may not be present); (b) development of the research questions; (c) unit(s) of analysis; (d) the logic linking data to propositions; and (e) the criteria for interpreting findings. Along this chapter only the propositions will be defined. The others components will be described in detail in Chapter 3, along with the research methodology used.

As mentioned previously, all other frameworks and processes proposed to analyze project actuality focused on large and complex engineering projects or large and complex public sector projects. Most of them demanded project maturity to delivery the understanding of project actuality. Not all of them is suitable for software development organizations. First because it would be impossible for some MSEs to have the kind of information necessary for most of the alternatives. Second because of "the intangible nature of software makes it peculiar, and makes it considered by many as a service, much more than a product" (ROSELINO, 2006) *apud* (REINEHR, 2008).

Due to the relevance of the MSEs to Brazil and to the software industry. In addition, in order to understand project actuality phenomenon in these organizations, and in pursuit to help those organizations to reflect on theories that can support them in increasing their competitiveness, we decided to design an approach, based on qualitative methods, to conduct project actuality investigation and analysis and teams' reflection.

The approach is useful for any researcher or practitioner that wants to analyze project ac-

tuality phenomenon. Moreover, it can help small organization to analyze its project management and organization's operation in order to reflect and act over problems.

The results of these studies are context-dependent and therefore can not be generalized to the sector of small software development organizations. Although, the approach allowed endorsing project actuality concept from the perspective of six small software development organizations in the Northeast region of Brazil.

1.2 Propositions

Considering the motivation, context and initial concept presented in the previous sections, the following propositions are defined:

1. By understanding project actuality we can give MSEs visibility of its problems.
2. By understanding project actuality we can help MSEs enhance its project management practices.
3. MSEs can awake to project management best practices and productivity through reflection.
4. Project is as rare concept in small software development organization.
5. There is little or no use of Project Management Body of Knowledge Guide (PMBOK) (PMI, 2008) practices in small software development organizations.
6. The project management practices are not systematized in this scenario.

It is assumed that: it is possible to build a theoretical approach to support analyzing and understanding project actuality phenomenon and support organizations to overcome their problems by helping them to engage in reflection, in small software development organizations at Brazilian software industry.

1.3 Objectives

The previous sections presented some of the initial concerns that motivated this research. Since it was not seen in the literature related to project actuality, nothing that answers these concerns satisfactorily and aligned with propositions defined above, the general objective of this doctoral thesis is: the definition of an approach to investigate, observe and analyze software project actuality, that helps to explain project actuality phenomenon in the context of small software development organizations in Brazil. Moreover, the approach will also support team reflection.

This thesis general objective decomposes in the following specific objectives that are expected to be achieved by the end of the proposed current research:

1. Conduct a systematic review on project actuality.
2. Define an approach based on literature review on qualitative methods for conducting research on software projects actuality, enabling academics and practitioners to observe, analyze and understand this reality and its contexts.
3. Conduct a series of investigations in order to refine the approach that helps to explain the critical issues surrounding the actuality in software projects management.
4. Contribute to a better understanding of software projects actuality in small software development organizations.
5. Support team reflection and engagement in order to evolve as project and organization by using project management best practices.
6. Evaluate the approach, considering a new set of investigations.

1.4 Thesis Structure

This introductory chapter presented the main aspects of this thesis proposal, describing the context, the motivation for its development, the assumption and its goals. It aimed on providing the reader with an overview of the research context and objectives. Besides this introduction, seven chapters make up this thesis. This work is organized as follows:

- Chapter 2 - Exploratory Literature Review: This chapter presents the main concepts associated with our research, such as project management, maturity models and project actuality.
- Chapter 3 - Research Method: This chapter describes the methods adopted for running this study and design of the proposed approach.
- Chapter 4 - Systematic Literature Review: This chapter presents the resume of the systematic review conducted in order to investigate what is the phenomenon of project actuality and the methods and techniques to observe and analyze this phenomenon.
- Chapter 5 - The approach: This chapter describes the approach idealized to observe and understand project actuality.
- Chapter 6 - The Project Actuality Findings: This chapter describes the results from the execution of the approach in six case studies, it discusses the project actuality phenomenon in each individual case.
- Chapter 7 - This chapter discusses the combined results obtained conducting the six case studies. It also presents some common problems and action from the action research. In addition it resumes the initial research questions and its propositions.

- Chapter 8 - Final Considerations: This chapter describes the conclusions, contributions and limitations of the work and possible future work for continued research.
- Appendix A - Invitation letter: It presents the invitation letter's template, in Portuguese. Before the beginning of each research, every organization received an invitation to participate on the research. It was adapted with the organization information and signed by all six organizations. The invitation letter explained the research to be carried and its confidentially terms.
- Appendix B - Research Plan: It presents the template in Portuguese of the research plan used in all the studies.
- Appendix C - The Approach modeled on Bizagi[4]: It presents the approach modeled on Bizagi and in the way it was distributed and presented among the organizations.
- Appendix D - Dimensions and Analysis example: It presents an example of the resume of the data analyzed for organization *F* on the dimensions driver. It includes considerations and each primary document and evidences grounds the data.

[4]Business Process Management Software - http://www.bizagi.com/

2

Exploratory Literature Review

Believe you can and you are halfway there.
-Theodore Roosevelt

Nowadays, projects plays an important role worldwide in various society aspects. The project management discipline has established itself with a competitive advantage (PWC, 2012). This chapter presents the exploratory literature review on the main concepts associated with our research. For instance project, project management and its evolution, project management models, maturity models, qualitative research methods and some of the latest ideas generated in this new knowledge field, among them the project actuality.

It is a vast field and therefore only a few important and useful concepts were selected to illustrate the discipline, as well as serve as a basis for the analysis that follows. In Figure 2.1 we have the class of concepts or areas researched along the exploratory literature review.

Figure 2.1: Areas of Research . Source: own elaboration.

2.1 Project Concept

The basic foundation for the entire project management area is the knowledge around the project unit. Some authors argue that the Tower of Babel construction or the Egyptian pyramids were some of the first "projects" (MEREDITH; MANTEL JR, 2011). The authors also presents that it is probable that cavemen formed a project to gather the raw material. The origin of the word **project** comes from the Latin *projectum*, stemming from the Latin verb *proicere* meaning "to throw something forward" (CHIU, 2010). In English, the term project, according to the Oxford Dictionary[1] means: an individual or collaborative enterprise that is carefully planned to achieve a particular aim. Therefore, a project is an activity with the aim of producing a unique physical product or service and with defined starting and ending point (CHIU, 2010).

The Project Management Institute (PMI), defines project as "a temporary endeavor undertaken to create a unique product, service, or result" (PMI, 2008). By temporary we understand that every project has start date and well defined conclusion date. By unique we understand that the product, service or result produced is different in some way from all other products or services produced by the organization.

Despite this general definition, there are some small specific changes in the general project definition. According to International Project Management Association (IPMA), project is a time and cost constrained operation to realize a set of defined deliverable (the scope to fulfill the project's objectives) up to quality standards and requirements (ASSOCIATION et al., 2006). For the Japanese project management Model (*Kaikaku* Project Management (KPM)-innovation, development and improvement), a project is construed to mean an independent undertaking with a unique purpose and conditions to be managed by a temporary organized body (OHARA; ASADA, 2009).

According to KERZNER (2013), a project can be considered as any number of activities or tasks, like:

- It has a specific goal to be completed according to certain specifications;
- It has specific start and end dates;
- It has limited funding (where applicable);
- It consumes human and nonhuman resources;
- They are multifunctional.

The three direct project goals are shown in Figure 2.2, with the specified project goals on the axes (required deliverable, budget limit and due date) (MEREDITH; MANTEL JR, 2011). According to Meredith, much has been written in recent years arguing about time, cost and specifications. There is a fourth dimension to be considered: the client's expectations. However

[1] http://www.oxforddictionaries.com/

the author affirms that the client expectations are not an additional target, but an inherent part of the project specifications.

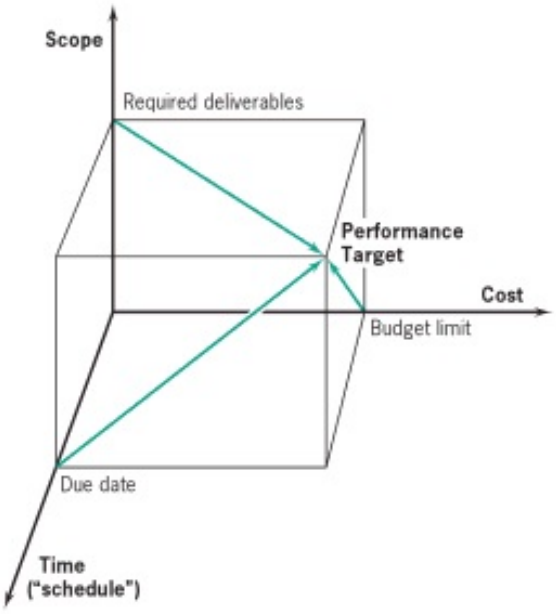


Figure 2.2: Direct project goal (MEREDITH; MANTEL JR, 2011)

Basically, projects can be applied in all areas of human knowledge, including administrative, strategic and operational work, as well as in our personal life. Project importance and influence for a variety of world achievements is so great that some authors mention "society projectification" (LUNDIN; SÖDERHOLM, 1998). Around this context, to manage projects effectively and efficiently it is presented as a solution and a large business world challenge (KERZNER, 2013). Therefore, project managers and organizational leaders must identify and be aware of effective and efficient ways to manage projects.

Not only is it crucial for organizations to manage their projects effectively and strategically, but poor execution can lead organizations down a path to peril. PMI's Pulse of the Profession finds that performance in meeting project goals, timelines and budgets significantly impacts an organization's ability to thrive (PMI, 2013a).

Projects are often made in order to achieve the goals of organization's strategic plan, or even a group of unique operational goals executed within a specific start and end date. The definition of project is important to our work, since some organizations did not use this kind of arrangement in its operations.

During the intervention, the action research step in phase 3 of our methodology strategy, organizational leaders and team members were encouraged to think about this definition and come up with their own adaptation, in order to organize their work into projects. Defining a starting and a end date, human and non human resources, identifying stakeholders, restrictions and the main goal were some actions to help structuring their projects. This step is explained in

Chapter 7.

2.2 Project Management and related concepts

The Modern Project Management, is usually said to have begun with the Manhattan Project (MEREDITH; MANTEL JR, 2011). The IPMA affirms that in the past thirty years, project management has been a discipline which has developed tremendously and increased in visibility. In 1965 the IPMA was founded in Switzerland and it is considered, therefore, the oldest project management association in activity. Currently it is more accepted and known in European countries. It is a nonprofit association whose mission is to support its members to achieve success and to promote the project management profession (ASSOCIATION et al., 2006).

The PMI provides a project management definition more focused on its practical application and related to the use of knowledge, skills, tools and techniques in the activities to be undertaken to meet the goals and expectations. And it still strives for balance between the perspectives' scope, time, cost, risk, quality, among knowledge areas (PMI, 2008).

For KERZNER (2013), project management is planning, organizing, directing and controlling organizational resources for a relatively short-term goal, that has been established to complete and meet specific objectives. Kerzner also claims that the project has a restriction on time, cost and performance, and if the project is running for an external client, a good relationship should be added as restriction. The author also states that managing projects effectively and efficiently is presented as a solution and a large business world challenge. So, more than ever we must engage on rethinking the management to guarantee the necessary reflection in order to identify effective and efficient ways to manage projects.

The project management context in organizations can be influenced by the following factors (PMI, 2008):

- The life cycle model chosen for the project;
- Direct or indirectly involved project staff;
- Organizational culture;
- Team members culture;
- Socioeconomic issues such as standards and regulations;
- Project Leader Managerial profile.

Managing projects, therefore, means the capability to identify the system, control the work, and to capture its output efficiently and effectively under required conditions (OHARA; ASADA, 2009). Also according to the Japanese KPM, although managing the process of

planning, implementing, checking and controlling overlaps with general management, it is more specified to meet the attributes and objectives of the project.

There are several examples of initiatives that seek to create consolidations in project management area, such as: the aforementioned PMBOK (PMI, 2008); ISO 10006 (ISO, 2000) and ISO/IEC/IEEE 16326:2009 (Systems and software engineering – life cycle processes – Project management)(ISO, 2009); the Projects in Controlled Environments (PRINCE2)(MURRAY et al., 2009); the IPMA Competence Baseline (ICB) (ASSOCIATION et al., 2006); among other initiatives.

Some standards and maturity models consider management aspects, like Capability Maturity Model Integration for Development (CMMI-DEV) (CMMI Institute, 2010) and Model to Brazilian Process Improvement for software (MR-MPS-SW) (SOFTEX, 2012). However, management is not their focus. Indeed, project management is a very important process area, but it still appears just as part of the production process. Even though it is not as known in Brazil, some maturity models focusing specifically on project management have emerged worldwide like: Organizational Project Management Maturity Model (OPM3) (PMI, 2003) and Japanese Project an Program Management (P2M).

According to PMI (PMI, 2013b), in 10 (ten) countries with established or in quickly development, project management industries and project management roles are expected to increase by over 13.4 million between 2010 and 2020, to over 41.5 million. In addition, between 2010 and 2020 the economic output of the profession in these 10 countries will increase by over USD$ 5 trillion to USD$ 12.37 trillion. Among those countries, China and India will lead the growth in project management. Generating approximately 8.1 million (China) and 4 million (India) project management roles until 2020. Nevertheless, the report presents nearly 1.4 million new jobs demand for project management roles by 2020, in Brazil.

In spite of the implementation barriers, including the need to do more with less, expanding global priorities, and enabling innovation, there are lessons to be learned from high performers and successful projects that can be replicated across organizations of all types to improve their value (PMI, 2013a).

Although project management concept has been changing and many are not fully defined (CICMIL; HODGSON, 2006), you can have a deeper understanding of the area from the observation of the evolution of their practices and models. According to the author, what we now call the project management is the evolution of practices initiated since the dawn of humanity.

The project management modernization and its establishment as an autonomous field of knowledge did not occur from any particular catalyst event or actor. This transformation was basically inspired by four sources (GAREL, 2013):

- Engineering Sciences, which for a long time has been interested in project conducting successful methods.

- The conduction of large projects, which led public authorities to assess and prepare

decisions.

- The socioeconomic development, which led to the technical, economic and sociological knowledge.
- Innovation management, which gradually became the main challenge in business competition.

Thinking in a wider definition of project management, we turn to Organizational project management. Organizational project management is the systematic application of knowledge, skills, tools and techniques in organizational activities and project, in order to achieve organizational goals through projects, in alignment with the achievement of strategic goals (PMI, 2003).

Project management is the branch of knowledge that deals with the planning, monitoring and controlling of what is characterized as a project. Besides, there has been a greater push to use projects to achieve more strategic goals, and filtering existing projects to make sure that their objectives support the organization's strategy and mission, or need to grow.

According to IPMA (ASSOCIATION et al., 2006), program management is the way to achieve a strategic change. And a program consists of a set of related projects and required organizational changes to reach a strategic goal to achieve the defined business benefits. In pursuance of the strategic growth, even if the organization does not have program management, they have related projects and they must try to make them work towards organization change and growth. In order to accomplish that, we must reflect on how we can get some organizational change through projects. Even though generally strategy is not an issue for the project manager. When we think about small development organization, we must believe and vouch that project is a part of an organizational change and it must deliver according to the business goals. And yes, disagreeing with IPMA the project manager or project leader is responsible for achieving the business benefits in a single project or a group of related project.

2.3 Maturity Models and Project Management

The term maturity model was popularized by the Software Engineering Institute (SEI) with the Capability Maturity Model (CMM) around 1986 (PAULK et al., 1994). A maturity model is a framework that describes, for a specific area of interest, a number of levels of sophistication at which activities in this area can be carried out (ALONSO et al., 2010). According to Alonso *et al.* a maturity model will make it easier for organizations to establish goals for process improvement and identify opportunities for optimization. The authors also affirm that the maturity model will likewise describe essential attributes that are expected to characterize a particular maturity level.The maturity level is defined as a well defined evolutionary plateau toward achieving a mature software process (PAULK et al., 1994).

Nowadays, we observe that the academy and the industry have demanded many maturity models to several knowledge domains. The basis for most of these maturity models was the CMM (PAULK et al., 1994). The author explains that CMM works as a framework that organizes a set of basic software engineering practices to guide the efforts of process improvement.

Since this research agrees with the vision that maturity models are a very good tool, not only for process improvement but also as a target for reflection and rethinking ones priority at a time. It can be a start point for the intervention phase, a few models were analyzed in this chapter. We considered the two most used (worldwide and in Brazil) and the one specific for project management.

2.3.1 Capability Maturity Model Integration (CMMI)

Capability Maturity Model Integration (CMMI) is a process improvement training and appraisal program and service administered and marketed by Carnegie Mellon University and required by many DoD and U.S. Government contracts, especially in software development (CMMI Institute, 2010). Currently supported is CMMI Version 1.3. CMMI is registered in the U.S. Patent and Trademark Office by Carnegie Mellon University.

The CMMI-DEV is a process improvement approach that provides essential elements for a effective process. It brings together best practices that address development and maintenance activities, covering the entire product life cycle from conception through delivery and maintenance (CMMI Institute, 2010). It is presented in two representations: in stages or continuous. Each representation organizes differently process areas, grouped by affinity categories: Process Management, Project Management, Engineering, and Support. In the category of Project Management, there are encompassed project management activities related to planning, monitoring and control. The process areas are distributed as follows throughout its maturity levels:

- Level 2 — Project Planning (PP), Project Monitoring and Control (PMC), Requirement Management (REQM), Measurement and Analysis (MA) and Agreement Management with Suppliers (SAM);
- Level 3 — Risk Management (RSKM) and Integrated Management Project (IPM) + Integrated Development of Product and Process (IPPD);
- Level 4 — Management Project quantitative (QPM).

2.3.2 Brazilian Process Improvement for software (MPS.BR)

From the acronym in Portuguese "Melhoria de Processo do Software Brasileiro", the main goal of the Melhoria de Processo do Software Brasileiro (MPS.BR) program is to develop and disseminate a software process model (the MPS model). The aim is to establish an economically viable pathway for Brazilian organizations, including Small and Medium Enterprises (SME).

And also to achieve the benefits of software process improvement and the utilization of good software engineering practices in a fair period within reasonable costs all over the country (SANTOS; WEBER; ROCHA, 2009). The reference MR-MPS-SW is the reference model from MPS-BR (SOFTEX, 2012).

The model created in 2003 is also adequate to support process improvement in large enterprises, even though the focus of the initiative is to help SMEs meet its business necessities and goals. The MPS model was defined based in ISO/IEC 15504 (EL-EMAM; GARRO, 1999) and ISO/IEC 12207 (ISO, 1998) and in conformity with the CMMI-DEV(CMMI Institute, 2010; SOFTEX, 2012).

The MR-MPS-SW is defined in two dimensions: process capabilities dimension and process dimension (SANTOS; WEBER; ROCHA, 2009). The process dimension describes seven sequential and accumulative groups of processes that correspond to maturity levels. The level G is the least mature level and level A is the most mature one. Different from CMMI, the Brazilian model does not present different processes for project management, for each level. What happens is that for each level, a set of new results is expected for the project management and other processes. The processes related to project management area are distributed as follows throughout its levels:

- Level G — Requirements Management and Project Management;
- Level F — Measurement, Acquisition and Project Portfolio Management;
- Level E — Human Resources Management, Project Management (new outcomes);
- Level D — No new outcome related do Project Management;
- Level C — Decision Management, Risk Management;
- Level B — Project Management (new outcomes).

2.4 Project Management Models, Methods and Body of Knowledges

2.4.1 Organizational Project Management Maturity Model (OPM3)

OPM3 was designed to help organizations translate strategy into successful outcomes, consistently and predictably. This standard has three key elements: (i) The knowledge element describes organizational project management and organizational project management maturity; (ii) The assessment element presents methods, processes and procedures that an organization can use to self-assess its maturity; (iii) The improvement element provides a process for moving from its current maturity to increased maturity (PMI, 2003). It provides a way to advance an

organization's strategic goals through the application of project management principles and practices.

OPM was intentionally designed without an overall systems of maturity "levels". The progression of increasing maturity designed into OPM3 consists in different ways of looking at an organization's maturity. One dimension involves viewing best practices in terms of their association with the progressive stages of process improvement, from standardization (i) to measurement, (ii) control (iii), and ultimately, to continuous improvement (iv) (PMI, 2003).

Another dimension involves the progression of best practices associated with each of the domains, first addressing project management(a), then program management (b), and finally, portfolio management(c). Each of these progressions is a continuum , in which most organizations aspire to advance (PMI, 2003). Figure 2.3 shows the multidimensional view.

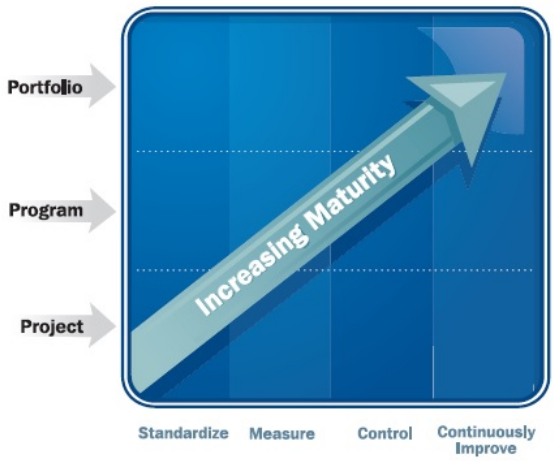


Figure 2.3: Organizational Project Management Maturity increases along a continuum (PMI, 2003)

2.4.2 Japanese Project Management

Japanese has its own style of management since many years ago. P2M is the first published philosophy of Japanese project management in year 2001 by Professor Shigenobu Ohara, and it combines entry-level project management, program management, and 11 segment management frames (OHARA; ASADA, 2009).

P2M is the first Japanese project and program management for enterprise innovation developed by Professor Shigenobu Ohara of the Nippon Institute of Technology in 2001, with the support of Ministry of Economy and Industry in Japan, and its standard is managed by Project Management Certification Center (CRAWFORD, 2009). The incentive was driven by METI (the Ministry of Economy, Trade and Industry of the Japanese government) in support of subsidies for the research and development of work represented by the author (Ohara, 2002) apud (OHARA; ASADA, 2009). The P2M model proposed a strategic framework for innovation in order to improve organizational values in project management methodologies (OHARA, 2005).

Innovations here include decisions to downsize or withdraw from unprofitable projects or further invest in potential ones, the restructuring of team members or projects, and an evaluation of employee performances. These enhancements and innovations will help ensure the success of certain projects or programs (SIANG; YIH, 2012).

According to OHARA; ASADA (2009), in the 1990s, Japanese companies experienced a deflationary recession called the "lost ten years". In order to survive the recession, they looked for solutions in the *kaikaku* (innovative reforms) of business management, organizations and technology, whilst struggling to regain their global competitiveness. Successful companies all had one thing in common, they applied a new project management paradigm which this book refers to as KPM (OHARA; ASADA, 2009). Among the features of KPM, its emphasis on creativity and teamwork, its broader "open value system" as opposed to a "closed technical system", its close links with corporate strategy and human resource development, and the support infrastructure needed for advancing KPM. According to the the authors, KPM holds special relevance today as global competition is increasingly reducing the life cycle of organizations. Managers will find in KPM not only a way to survive the shake-up, but also a framework of value creation for the next generation.

KPM is defined as encompassing the 3 K's of *Kakusin* (innovation), *Kaihatsu* (development) and *Kaizen* (improvement), or more specifically, the unity to be challenged and linked to corporate-level strategy (OHARA; ASADA, 2009), that summarizes:

- KPM is the advanced version of P2M, linked to corporate strategy and positioned as practical implementation methodology in terms of the owner's view.
- KPM intends to explore the framework of enhanced methodology of strategy implementation in the form of the hybrid of lateral and cross-functional collaborations.
- KPM encompass the 3 K's of *Kakusin* (innovation), *Kaihatsu* (development) and *Kaizen* (improvement).

Our work is aligned with the belief that "project" must be linked to corporate strategy and project management an value creation process. In addition, our approach also worries about the knowledge creation. Figure 2.4 presents the KPM framework.

As far as this research went, this model is not used or implemented by Brazilians organizations.

2.4.3 PRINCE2

The Projects in Controlled Environments (PRINCE) was developed by the United Kingdom in 1989 as the standard method for managing information technology projects. Throughout the years, the method has been improved to PRINCE2 and proved to be an excellent approach to best practices applicable to the management of all types of projects. This project management

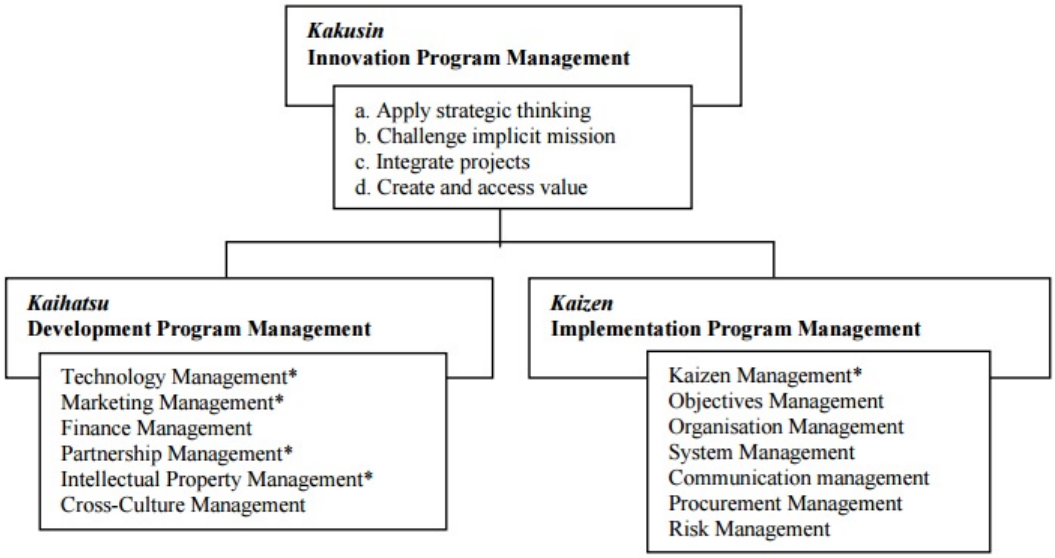


Figure 2.4: KPM Knowledge Framework (OHARA; ASADA, 2009)

structured method. It is adaptable to any type or size of project and covers its management, control and organization. PRINCE2 has been adopted as the standard for all government projects in the UK and widely used by the private sector not only in that country but also elsewhere in Europe, Africa, Oceania and the United States (ANGELO, 2009).

PRINCE2 is a scalable, flexible project management method, suitable for use on any type of project (BENTLEY, 2009). According to the author, it has been derived from professional project managers' experiences and refined over years of use in a wide variety of contexts. It is owned by a stable public authority, the Office of Government Commerce (OGC), that is committed to maintain the currency of the method, together with the manual and other books used to define the method. Bentley states that PRINCE2 gives:

- Controlled management of change by the business in terms of its investment and return on investment;
- Active involvement of users of the final product throughout its development to ensure the business product will meet the functional , environmental, service and management requirements of the users;
- More efficient control of development resources.

PRINCE2 separates the management layer from the work to create the required products that the project has to produce (specialist work) (MURRAY et al., 2009). The Management Layer refers to the organization of the project, such as Project Board, Project Manager and Teams. It has 6 variables targets: Timescales, Costs, Quality, Scope, Benefits and Risk. PRINCE2 is principle-based, meaning that a PRINCE2 project includes 7 principles (MURRAY et al., 2009):

- Continued business justification;

- Learn from experience;
- Defined roles and responsibilities;
- Manage by stages;
- Manage by exception;
- Focus on products;
- Tailor to suit the project environment.

The meanings related to learn from experience and to tailor to suit to the project environment were inspiration for the approach and in some occasion discussed with project managers.

2.4.4 Project Management Body of Knowledge (PMBOK)

The PMI is a nonprofit organization, established in 1969, whose main goal is to contribute to project management continuous improvement. Moreover, there is the effort to catalog best practices in project management along with its disclosure through the PMBOK, comprising a guide containing the whole body of knowledge of traditional, advanced and innovative practices in management projects (PMI, 2008). Additionally, based on the PMBOK guidelines, project management comprises a set of processes that contains areas that constitute the project management body of knowledge.

According to the PMI (INSTITUTE, 2013), through the PMBOK, project management can best be explained by processes that comprise it (Initiating, Planning, Executing, Controlling and Closing) and their areas of expertise: Integration Management Design, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Human Resources Management Project, Project Communications Management, Project Risk Management and Procurement Management and Stakeholders Management.

Each knowledge area has its processes that belong to process groups. According to PMBOK (INSTITUTE, 2013), the definition for these project management process groups, is as follows:

- The Initiating Process Group consists of those processes performed to define a new project or a new phase of an existing project by obtaining authorization to start the project or phase.
- The Executing Process Group consists of those processes performed to complete the work defined in the project management plan to satisfy the project specifications.
- The Planning Process Group consists of those processes performed to establish the total scope of the effort, define and refine objectives, and develop the course of action required to attain those objectives.

- The Monitoring and Controlling Process Group consists of those processes required to track, review, and orchestrate the progress and performance of a project; identify any areas in which changes to the plan are required; and initiate the corresponding changes.

- The Closing Process Group consists of those processes performed to conclude all activities across all Project Management Process Groups to formally complete the project, phase, or contractual obligations.

Not all knowledge area and process were used along this research. Although everything was analyzed, one area and a few process were excluded or combined. Procurement Management was not seen in our sample and for that it was removed from our “subset PMBOK”, same happened with the process acquire project team from the area of Human Resources Management. Some other process were combined to facilitate analysis and/or presentation of the findings such as risk quantitative analysis and risk qualitative analysis, in our subset represented by “Risk Analysis” and the processes control communications and manage communications were also combined into "Manage and control Communications". The process develop schedule was also suppressed and analyzed with the process Plan schedule management. Figure 2.5 presents the subset of PMBOK considering the aforementioned adaptations. The mind map exhibit knowledge areas and its process explored along the research.

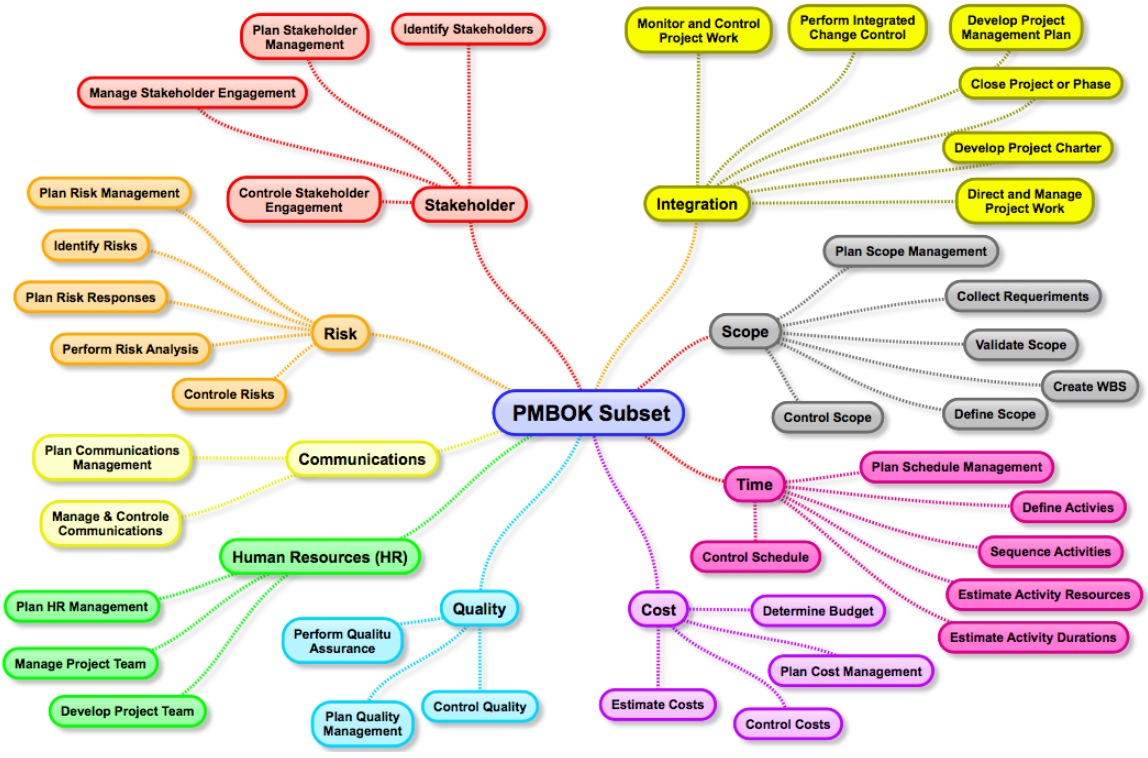


Figure 2.5: Project Management Knowledge Areas Mind Map: a subset. Source: own elaboration.

2.4.5 IPMA Competence Baseline (ICB)

Out of all models and methods that focuses in Project management, ICB was the most relevant. The IPMA defined what skills are expected for project management professionals through ICB which is the common framework by which to govern all associations, members and certification bodies that use competency information to assess candidates (ASSOCIATION et al., 2006). It provides access to technical competence elements, behavioral and contextual project management aspects and techniques. The so-called "the eye of competence" is the project management elements integrated, from project manager's perspective, against a specific situation. In our opinion, the eye is an appropriate symbol since represents the vision and perspective of a project management practitioner.

In ICB, there are three ranges containing related competence elements(ASSOCIATION et al., 2006), also presented in Figure 2.6:

- **Technical competence** elements deal with the project management matter, on which the professional are working. It covers the project management content (solid elements). The ICB contains 20 technical competence elements;
- **Behavioral competence** elements deal with the personal relationships between the individuals and groups managed in the projects, programs and portfolios. It covers the project manager's attitudes and skills.The ICB contains 15 behavioral competence elements;
- **Contextual competence** elements deal with the interaction of the project team within the context of the project and permanent organizations. It covers the project manager's competence in managing relations with the line management organization and the ability to function in a project focused organization. The ICB contains 11 contextual competence elements;

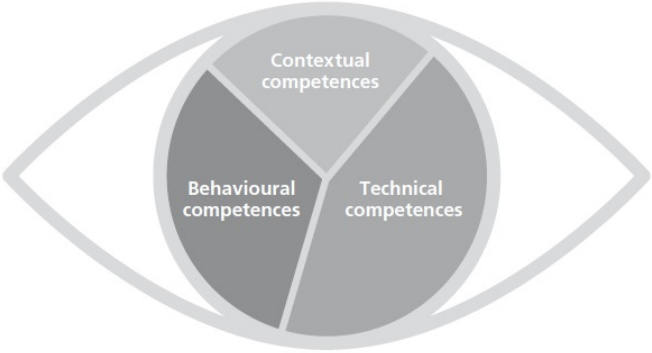


Figure 2.6: The Eye of Competence (ASSOCIATION et al., 2006)

The technical elements are very much like what PMBOK (PMI, 2008) or other methods and models preach for techniques, knowledge areas and processes. Although they go beyond it

with technical elements such as Teamwork. For ICB (ASSOCIATION et al., 2006), teamwork covers the management and leadership of team building, operating in teams and group dynamics. Teams are groups of people who work together to realize specific objectives. Team spirit (i.e. getting people to work well together) can be achieved through individual motivation, team goal setting, social events and supporting strategies.

Other models do not deal with the Behavioral competence elements. Moreover, for this work, the perception of these elements were important to understand project actuality and project context. Elements such as *Leadership* that states that a good leader can delegate tasks, has confidence in others and coaches them to develop and live up to expectations; the pressure allowance and blaming teams are not adequate actions (ASSOCIATION et al., 2006). *Reliability*, that according to ICB, being reliable builds trust in others who know that you will live up to what you have promised to do. Reliability covers responsibility, correct behavior, robustness and confidence. It implies minimizing errors as well as openness and consistency. Reliability is a characteristic that interested parties value highly. And *Engagement and Motivation*, that according to ICB, gives others responsibility and delegates authority, takes the blame and shares the credit. It also stimulates team involvement and the cooperation of different disciplines; moreover, actively manages motivation levels. Other elements we explored were also present in agile methods, such as openness, efficiency, values appreciation, negotiation, among others.

The ICB also presents a behavioral pattern for each element. The partial pattern for the element Leadership is presented in Table 2.1.

Table 2.1: Leadership partial pattern (ASSOCIATION et al., 2006)

Adequate behaviors	**Behaviors requiring improvement**
Can delegate tasks, has confidence in others and coaches them to develop and live up to expectations	Doesn't delegate and doesn't coach or develop others
Is inspiring, makes people proud to work with him	People don't feel attracted by his personality
Has a vision, expresses it very clearly, supports it well and brings it to life	Can be self-absorbed, changes direction easily, has no vision, doesn't support ideas
Delegates SMART (Specific, measurable, achievable, realistic, time-bound) work packages appropriate to a team member's capabilities and gives them the freedom to do it their way	Doesn't manage using SMART principles and narrows the scope of actions of subordinates by obligating and controlling them
Is a skilled moderator	Cannot moderate processes or conflicts
Adopts a leadership style appropriate to the specific team and work situation, is open to feedback	Always leads in a predictable way and is defensive about his own leadership behavior

The context elements are related to the business knowledge, although it had a smaller impact on our studies.

2.4.6 Some Agile Methods

Nowadays, agile methods appear as an alternative to software development organizations as a faster and mode adaptable to the client's needs. Agility is the ability to both create an respond to change in order to profit in a turbulent business environment; it is the ability to balance flexibility and stability (HIGHSMITH, 2009). According to LYYTINEN; ROSE (2006), it is the ability to sense and respond to technical changes and new business opportunities.

Agile methodologies and their strategies began with the agile manifesto (BECK et al., 2001), in which experts united to argue that the following values should be applied to software development:

- Individuals and interactions over processes and tools;
- Working software over comprehensive documentation;
- Customer collaboration over contract negotiation; and
- Responding to change over following a plan.

Some agile methods and its techniques were used as reflection topics and presented to the organizations. Scrum (SCHWABER, 2004), eXtreme Programming (XP) (BECK, 2000) and Lean (POPPENDIECK; POPPENDIECK, 2003, 2007) were chosen for the analysis and reflection. Scrum was used as a methodology, a framework for starting the agile project management, XP to introduce some practices as productivity tools for the team, and Lean as its focus on combating waste, reflected in its principles.

Scrum supports project management as it has the following characteristics (SCHWABER, 2004):

- Short software development cycles, called Sprints;
- Constant delivery of functioning software to the client;
- Multidisciplinary and self-manageable teams; and
- Daily meetings to monitor the team among others.

XP, for its part, is a discipline of software development based on values of simplicity, communication, feedback, courage, and respect (BECK, 2000). It works by bringing the whole team together in the presence of simple practices, with enough feedback to enable the team to see where they are and to tune the practices to their unique situation. According to Beck, adopting XP is also related to transforming problems into opportunities: personal growth, deepening of

relationships and improving the software produced. The attitude of simply solving the problems is not enough to reach the level of excellence in the production of software.

According to DINGSOYR et al. (2012), the vast majority of published articles talk about XP, despite SCRUM being more dominant in the industry. Nevertheless, in recent years, Scrum has been gaining more and more prominence and has already surpassed other methods in annual publications. Scrum is a technique for agile project management while XP focuses on agile development and Scrum on agile project management. Both follow agile values and principles but each with its own focus and practices.

POPPENDIECK; POPPENDIECK (2007) presents how the seven principles of lean manufacturing can be applied to optimize the whole information Technology value stream. The stated principles are:

- Eliminate waste. Lean thinking advocates that any activity that does not directly add value to the finished product is a waste. To reduce waste it is critical that development teams be allowed to self organize and operate in a manner that reflects the work they're trying to accomplish.

- Build in quality. Agile practices which build quality into your process include Test Driven Development (TDD) and non-solo development practices such as pair programming and modeling with others.

- Create knowledge. Planning is useful, but learning is essential. You want to promote strategies, such as iterative development, that help teams discover what stakeholders really want and act on that knowledge. It's also important for a team to regularly reflect on what they're doing and then act to improve their approach.

- Defer commitment. It's not necessary to start software development by defining a complete specification, and in fact that appears to be a questionable strategy at best. Support the business effectively through flexible architectures that are change tolerant and by scheduling irreversible decisions to the last possible moment.

- Deliver quickly. It is possible to deliver high-quality systems quickly. By limiting the work of a team to its capacity, which is reflected by the team's velocity, you can establish a reliable and repeatable flow of work. An effective organization does not demand teams do more than they are capable of, but instead asks them to self-organize and determine what they can accomplish. Constraining these teams to delivering potentially shippable solutions on a regular basis motivates them to stay focused on continuously adding value.

- Respect people. Sustainable advantage is gained from engaged, thinking people. Focuses on motivating and enabling teams, not on controlling them.

- Optimize the whole. Manage programs of interrelated systems so you can deliver a complete product to your stakeholders.

2.5 Project Actuality and Related Works

Project management practice is seen as a social conduct, defined by history, context, individual values and wider structural frameworks. As mentioned foremost, actuality research, demonstrates a deep interest in lived experience of project actors, with the aim to understand what is actually going on in the arrangements labeled "project" over time (CICMIL et al., 2006). Researching the actuality of projects means focusing on social process and how practitioners think in action, in the local situation of a living present (CICMIL, 2006). Thereby achieving an alternative of what project managers do in real project situations and to explore skills and knowledge that constitute the social and political action in managing projects.

Actuality can be seen by focusing on practical action, on lived project team experience, on the team optimization abilities, on the team emotional maturity, on quality of the social interaction inside the team and also with users and clients. Researching the actuality of projects, therefore, consists of "gathering, analyzing, and disseminating knowledge about people working in concert with things, technologies, each other and the means through which these relations are coordinated and controlled, for what ends" (CICMIL, 2006). The authors present that while a great deal is written about traditional project management, we know very little about the actuality of project work and management.

According to CRAWFORD et al. (2006) the knowledge and practices covered by project management bodies of knowledge represent only a relatively narrow part of what is needed to effectively fulfill their roles. The authors stated that the need for relevant practitioner development goes beyond the development of trained technicians to reflective practitioners. Learning should be interpreted as a social process in which the individual is able to integrate their learning with the development of the organization and its practices (SENGE; SUZUKI, 1994). Indeed it is though just to maintain an awareness of other possibilities, of "routes not taken" (HODGSON; CICMIL, 2007), but the idea is to try to make this learning process possible by the approach proposed, even though it requires an intensive work .

SAUER; REICH (2009) tried to understand the new mindset that will drive project managers to advance practice in the ways implied by the rethinking project management network. Their findings, depicts among other things, showed that there are many opportunities for pursuing the idea of projects as a knowledge process, such as investigating in what ways managing projects as a knowledge and learning process can enable improved performance. The authors also condensed four personal qualities that help professionals to rethink project management. The qualities were: people development, learning orientation, creativity and innovation. That sure sounds like seeing project, team's work as a knowledge tool.

Although procedures, processes, conventional methods, books and techniques are used as

a useful tool for Project management guidance, it does not help us to adapt to a specific context. Conventional methods do not help practitioners to engage in reflection and to reason with other ways of get over some difficulties or overcome some problems.

WINTER; SZCZEPANEK (2009) contribute to this research area with a book that encourages practitioners to think about projects from multiple perspectives. The authors' premise is that, just like organizations, projects mean different things to different people. They can also be viewed in different ways by practitioners. CICMIL et al. (2006) proposed a shift in thinking and research orientation to tackle the identified and so far neglected themes from practitioners' experiences with project working and management, creating knowledge which is relevant to practice and reflects the interests of both academic and practitioner communities.

MAANINEN-OLSSON; MÜLLERN (2009) analyze project focusing on understanding the ways in which project centered activities are shaped in time and space. The authors use semi-structured interviews, observations and secondary data to analyze the combined effects of the spatial and temporal aspects . The study was conducted in a large industrial company in Sweden. Our research was inspired by theirs, where the activities were undertaken as they came up and the learning had to cope with situations as they emerged during the project's whole life cycle.

LALONDE; BOURGAULT; FINDELI (2012) proposed a framework to also examine project management from the practice viewpoint, focusing on large scale architectural project with a budget of over one billion dollars.

Among the related works, the framework from LALONDE; BOURGAULT; FINDELI (2012) stands out. They proposed a framework to also examine project management from the practice viewpoint, where they explore the inquiry process by which actors grasp project situations. In order to facilitate investigation and further formulation of a new perception of project management practice, the authors described how actors actually think and act in project situations. The authors' idea was focused on the inquiry process by which project actors state what they perceive. Their objective was to depict the interactions between project actors and to gain a deeper understanding of the processes involved. Their strategy or approach was to capture the discourse of actors who are working on projects and examining the ways in which these actors enter into, question and act on project situations.

Considering project management practice as a situated inquiry process, LALONDE; BOURGAULT; FINDELI (2012) investigate how actors describe and analyze project situations through discourse. Where the basic data were derived from verbal interactions, although a variety of data collection devices were used. The authors established framework based on an epistemological stance. The idea is to study what the actors do and how they do it. The theoretical framework was built in order to facilitate such investigation.

Along the research we also used the actors as researchers as well as the authors (LALONDE; BOURGAULT; FINDELI, 2012). But the data collection and the primary construct is different from the ones used by the authors. We did not use actors affirmations by itself, we

use actors' affirmations as much as actions, practices, methods and context, in observations, interviews and document analysis. In our research, the data collection methods and data analyzes are very much alike to the ones used in systematic review. We also used the actors as researcher but our field was software development in small organizations, where in some cases, did not even organize their work as a traditional project. In small projects we can easily gain trust, mix as peers and be around the entire project or series of projects. Besides, in later phases, some ideas were presented, reflected and exchanged with project actors and actions were immediately implemented or adjusted promoting findings for this research and knowledge for the organizations.

Their fieldwork required the researcher to sit in on meetings of the teams responsible for strategic and managerial decisions as well as technical and design aspects. The unit of analysis was strategic level committee meetings. The authors observed 31 units. The committees dealt with strategic issues regarding the project's financial viability and control, contractual and legal issues, design and engineering aspects, and visibility and public relations. Their teams could include managers, engineers (e.g., computer, electrical, building or mechanical), architects and lawyers, not to mention a range of specialist consultants (e.g., environmental or business).

Their first researcher's task was to embed himself into the practice situation, that was listed as a team member. He had access to meeting schedules, as well as minutes and transcripts, which he received shortly after each meeting. Insofar that he was able to view the working documents, preliminary plans and/or bids that were discussed at the meetings, the researcher was treated as a participant.

The authors presented among other, the following findings (LALONDE; BOURGAULT; FINDELI, 2012):

- In terms of action, the problem is not so much identifying and interpreting the facts as the action criteria that the actors propose.
- The discussions are carried on continuously, with alternations between factual and preferable judgments.
- Project management practices appears to have an analytical as well as a moral or political component that bears on the consequences.
- Project are not immutable and that the project boundaries evolve and transform.
- The agreement is therefore not based solely on the actors' knowledge, or more generally speaking, the project situation as such, but also on the values and principles that guide the actors and underlie their actions.

Although the authors mentioned they used Atlas.ti to perform the analysis, no hermeneutic unit or causality was presented from this analysis. And the paper does not present a step by step process or framework able to be reproduced. Moreover, since they were in strategic

committee, the authors focused in the decision analyzes, and the derivative factual or preferable judgments. Something not present in software projects, neither in small software development organizations.

The biggest contribution, besides the "atmosphere of trust" and the ethnographic based approach, was that:

> "...emphasized that this type of theorisation can serve as a tool of thought, a cognitive tool to nurture project management practice by systematically adopting a reflective and critical stance toward the inquiry trends."

JAAFARI (2007), presented a systematic approach to assess the health of large projects or programs at any point in their life, by analyzing how systemic the project team is in its management of project variables. According to the authors, the project health check (PH-Check), a computerized and online tool, applies up to 67 indicators to assess the health of a project at a given time. He understood that different projects need different approaches to succeed and that main role of the project health check is to assess the managerial performance and capabilities applied to a given project. One of his findings was that "Management of a project cannot be improved by focusing on the capabilities alone; it is essential that the capabilities are effectively employed via dynamic and responsive methodologies."

Jaafari's generic process for assessing the management is described in Figure 2.7. And its relation with project life cycle is presented in Figure 2.8.

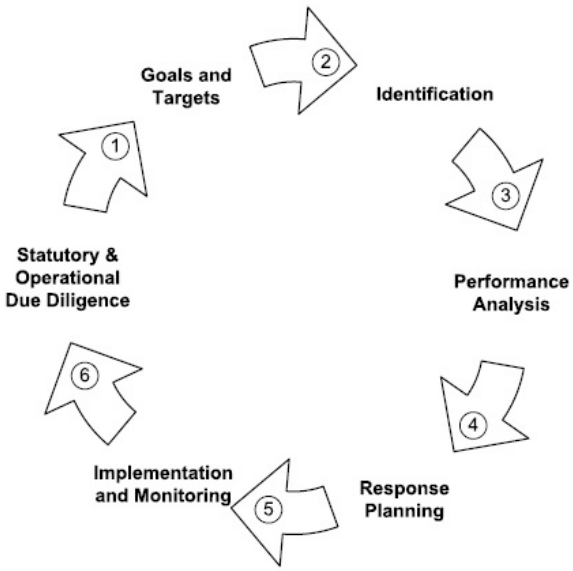


Figure 2.7: Generic process for assessing the management (JAAFARI, 2007)

The author (JAAFARI, 2007) concluded that in the analyzed case projects the management was below average (Practice Level is 2). And stated: "Clearly, for such large complex projects the management must aim for a much higher level (preferably 4) otherwise the project

results will be below expectations. Indeed, these case projects had suffered substantial time and cost overruns and were considered as sick hence the reason for the application of PH-Check."

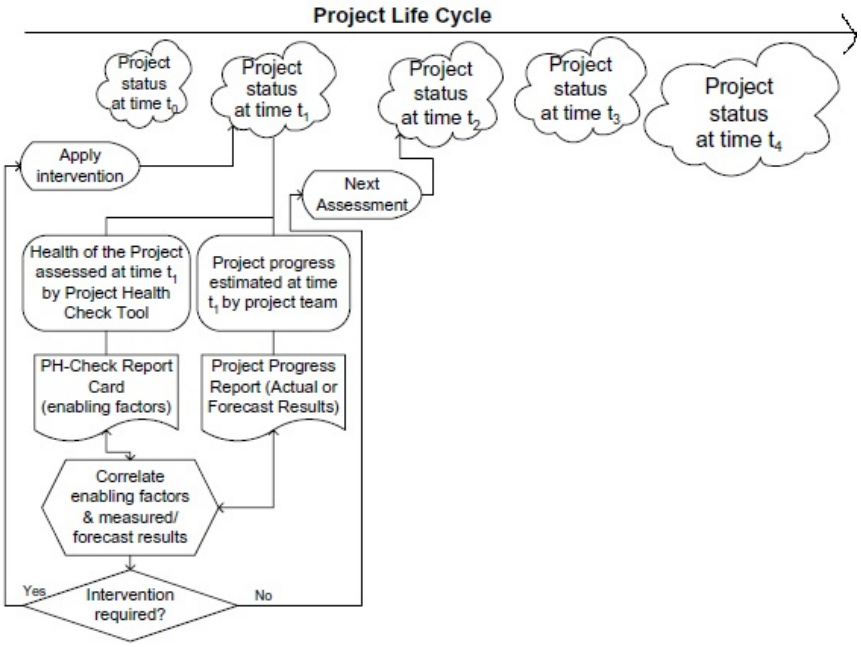


Figure 2.8: Project health check and project life cycle (JAAFARI, 2007)

Our approach was also inspired by Jaafari's generic process and it also analyzes project by a key factors perspective. Although, we consider the context, the team, and a wider number of factors to analyze project actuality. Instead of health checks, we considered PMBOK (PMI, 2008) process areas and capability maturity model, such as MR-MPS-SW (SOFTEX, 2012) to analyze the project and mainly to guide the action plans in the intervention. Scrum (SCHWABER, 2004) practices or techniques were also analyzed and inspired some actions as well. Although Jaafari had a more quantitative approach, even though he focused at the capabilities managerial approach. Besides, we did not only focused along project life cycle, but also before and after the project was constituted and planned.

WINTER; SZCZEPANEK (2009) in their book images of project , present a pragmatic framework where every project must be seen seven different perspectives. It perspective covers aspects such as:

- Social perspective: This perspective considers aspects such as the events, decisions and actions leading up to the current situation (that is, the social history of the project so far) and how the various people and organizations have interacted up to now.
- Political perspective: By which we mean the individuals, groups and organizations all pursuing their own interest and agenda.
- Intervention perspective: It covers aspects such as perceived situation to be improved.

- Value perspective: Creating value not just wealth creation, but also other kinds of value and benefits.
- Development perspective: What needs to be developed and by what date and within what budget. Development not just as product development, but also as people development.
- Organizational perspective: Seen a project as a temporary organizations. Considering roles, responsibilities, team structure, governance arrangements and so on.
- Change perspective: Consider aspects such as context and rational for a change, the scope of the planned change and the perceived readiness for change amongst the various people and organizations.

Most of the perspectives are aligned with our worries into understanding individuals motivations, teams and organization motivation, hidden agenda, politics, culture. WINTER; SZCZEPANEK (2009) were definitely an inspiration to the search of understanding project actuality and its multiples images.

CICMIL et al. (2006) proposed a pragmatic research of project actuality to generate knowledge and to build theories, which have the following qualities. CICMIL (2006), in her work on understanding the practical action and managerial conduct in complex project environments, through a critical and interpretative perspective, presented a research approach that can generate insights and illustrate the key claims. This approach consists in a research activity as a knowledge creation process, as we can observe in Figure 2.9.

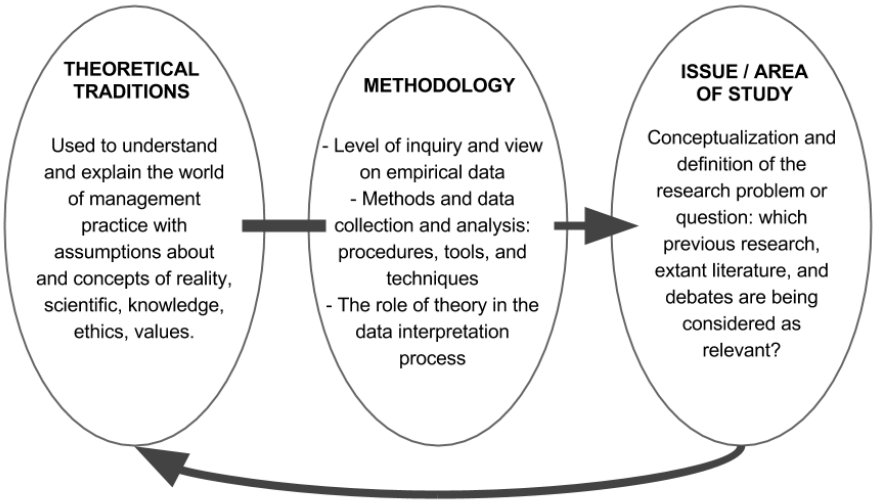


Figure 2.9: Understanding the research as a holistic intellectual activity (CICMIL, 2006)

The approach proposed follows the same line of a pragmatic research to understand the practical action in managerial conduct. And it hopes to explore this idea of project as a

knowledge process and analyze the mindset of small software development organizations. The main difference is the steps to capture the qualitative data, the approach and the samples analyzed. We added up a few approaches, frameworks, ideas and tips published in the literature to build our approach following Cicmil's line of research.

Although many works contributed for the approach conception, as mentioned along this section, a few were the related ones. Table 2.2 and 2.3 discloses the main aforementioned related works with their goals and the main differences to this work.

Table 2.2: Related Works (Part 1)

Related Work	**Main Goal and Difference**
JAAFARI (2007)	Their research focused on developing a theory and application of diagnostic concepts to assess the health of large projects or programs at any point in their lives. It was possible by evaluating the actual practices applied to manage project variables and how systemic was the project's team with those variables. His goal were to classify a project. Study the phenomenon and understand it was not in his agenda. For each criteria (customer satisfaction, project delivery system, finance, risk and due diligence, stakeholders, technology among others) they had indicators and metrics that would position the project in a specific level for each criteria. It would be necessary a lot of data in order to use their method, not available in micro and small organizations. Besides, our approach is concerned to understand the aspects beyond the numbers or metrics. Our work is qualitative. Every act, reaction and motivations were all important criteria to understand the actuality. Their theory was only written in macro steps with no description or details.
MAANINEN-OLSSON; MÜLLERN (2009)	The authors explored the way project is shaped in space and time and described the way managers deal with the challenges of both dimensions. They tried to prove the importance of both dimension to understand project and its context. The work did not present a visual or step by step process that would help a researcher or practitioner to conduct a similar study. Their focus were on interviews along specific moments of the project and the use of observations only to validate themes emerged. In our approach we used ethnographic techniques and carried observation along the entire project and across projects. Reaching to every single aspect that would emerge from it, besides time and space. In addition, their concerns were project management practices in large industrial company in Sweden, in contrast we focused on micro and small software development organizations.

Table 2.3: Related Works (Part 2)

Related Work	Main Goal and Difference
CICMIL et al. (2006)	The authors formulates a research approach that "takes seriously practitioner's lived experience of projects". Their focus is on a new way of researching and exploring the ontological and epistemological assumptions underlying this kind of research. Aiming on what must be looked at on project actuality inquiry than on how to do it. The only data collection method mentioned was interviews. Their findings were not presented as actuality phenomenon, much as a reflection of this kind of research and what it can concur. Our approach suggests steps to observe and to understand the project actuality phenomenon that complement this work on establishing a concrete way of doing the king of research the authors preach.
LALONDE; BOURGAULT; FINDELI (2012)	The authors adopted a grounded theoretical research strategy, exploring the inquiry process by which actors grasp project situations. They also introduces the importance of the reflective practice. By far the most similar work, once related to motivations and practices, although they focused on large architectural project developed by several teams and over 50 people involved. Our approach monitored and analysed more than strategic meetings, and the reaction, body language, motivation were also considered not only the discourse as in their work. More over, once again there was no steps, process or approach defined in order to replicate the work executed by the authors.

2.6 Organizational Culture

When understanding project actuality we must discuss about organization and team's culture. Organizational culture can be understood as the forms of behavior members feel are appropriate within their organizational holding environment it represents "how things are done in the organization" (GOULD; STAPLEY; STEIN, 2006). WINTER; SZCZEPANEK (2009) defines these behaviors as the roles, routines, structures and symbols within an organization. Using the iceberg analogy for organizational culture, the visible part consists of the formal structures, symbols, routines and strategy and the invisible part consists of social networks, beliefs, values, attitudes towards authority, conventions and taboos (WINTER; SZCZEPANEK, 2009; GOULD; STAPLEY; STEIN, 2006).

It is also important to understand the invisible. The drivers, the motivations that we cannot really see on the daily routine, sometimes are the main organizational drivers. Once again, the techniques used along this research helped unveil the invisible drivers and understand the organizational culture or even more specific team's culture.

2.7 Action learning and reflective practitioner

This section present a brief summary on action learning and reflective practitioner literature review, both concepts inspired part of the approach willing to help the actuality observed.

Action learning focuses on the individual that is presenting the problem or challenge. It also creates an opportunity for curiosity from the participants in the room (DUNTON, 2008). The philosophy behind action learning is that individuals are offered a safe environment, with the support and encouragement to reflect and take ownership of problems and challenges and to find new ways of facing them (POUNDER, 2009).

BENNET; BENNET (2008) present their point of view, stating that:

> With learning comes knowledge, with knowledge comes action and with action comes change (p. 378)...Knowledge is the capacity to understand situations, recognize their meaning and implications, identify underlying problems (versus symptoms), create solutions, make decisions and implement effective actions (p. 379).

Along our research, all references pointed to DEWEY (1933) as the first to identify reflection as a specialized form of thinking. The author considered reflection "to stem from doubt, hesitation or perplexity related to a directly experienced situation". Dewey also argued that reflective thinking moved people away from routine thinking and action, guided by authority, towards reflective action (involving careful, critical consideration of taken-for-granted knowledge) (WILDING, 2008).

The concept of "reflective practice" gained influence with the arrival of Schon's "The reflective practitioner: how professionals think in action" (SCHÖN, 1983). Schon identified ways in which professionals could become aware of their implicit knowledge and learn from their experience. His main concern was to facilitate the development of reflective practitioners rather than describe the process of reflection *per se*.

At that time, the professional's perspective, or practitioner's perspective, was introduced by SCHÖN (1983) to refer to the fact whereby professionals (architects and musicians, etc.) rethink and review their work during and after they have undertaken a creative process. According to him, one can distinguish two types of reflection, which he calls reflection **in action** and reflection **on action**. The reflection in the action is performed as events unfold, while reflection on action is a retrospective think about an experience, after performance of the activity or during a pause or interruption. Schon and his books were a great inspiration for this work. Part of our qualitative approach considered reflection both ways, as the events unfold and in the end of the cycle.

CLIFFORD (2008) believe that reflection is an essential part of the learning process, and reflective practice is the method whereby the reflection becomes a conscious and structured activity. According to these authors, the reflection should be inserted in any activity, project

or element work for the purpose of maximizing the learning from daily activities. For BOUD et al. (2013) reflection is a very important activity to human, in which people recapture their experience, thoughts, meditate and make evaluations about them. COOPER; MAJCHRZAK; FARAJ (2005) believe that learning is the result of combining action and reflection. The actions, associated with making it work on the projects, provide experiences that set the stage for the learning. But in order to close the learning cycle, it requires a lot of thinking and reflect about those experiences.

A reflective culture makes it possible for people to constantly challenge without fear of retaliation. Inspiring reflective practice in an organization does not have to be an onerous task, even for top managers. Although they are, by definition, people of action, they are also people who, when given a hospitable environment, like to compare experiences and, moreover, to help one another (RAELIN, 2002). Realin affirms that:

> As we face problems in our work, we tend to go no further than consulting our "solution database" to search for an answer. Our solution database contains all the standard answers and assumptions we have used in our past to solve our problems. In thinking about thinking, we are actually able to reflect together about our solution databases and add to them or alter them entirely. In this way, we reflect together with trusted others in the midst of practice (RAELIN, 2002).

According to ESKEROD (2010), typically, action learning involves a small group of people, like four to six, known as a "set", who work together on real problems. Although action learning may be a promising way of facilitating leadership development as it involves reflective thinking, reflection does not come naturally or even easily to most managers. That explicit attempts to encourage adoption of learning and reflective practices through either logical explanations or development sessions have been largely unsuccessful (SMITH, 2001).

However, in action learning activities, a facilitator has been present in the set (PEDLER; ABBOTT, 2008a). This research presents several studies, where the main researcher acted as a facilitator during its execution. PEDLER; ABBOTT (2008a) stated that the facilitator should possess good process skills and that content skills are of minor relevance.

We have always looked for someone with communications skills, and have already seen as a leader, usually a technical one by the team. Even though potential facilitators were identified inside each organizations, sometimes team members did not see or recognize the facilitator as a role. Perhaps he did not have the motivation to keep going or even did not feel comfortable with the role. So, in order to overcome this problem and keep the organization in a reflective mode and able to rethink and take appropriate action even without the facilitator, we created wild cards, to help practitioners reflect and engage in rethinking in order to take the appropriate action. Each problem had several questions that reinforces the need to reflect and several references and acts suggested for analysis.

Our work is aligned with Pedler and Abbott's, where we see reflection and action learning

as a suitable educational approach to enhance and nurture workplace learning (PEDLER; ABBOTT, 2008b), involve team members in working on their own problems, issues, impediments, reflecting and taking appropriate action. Indeed, action learning is a maturing approach to management, leadership and organizational development (PEDLER; ABBOTT, 2008a). But unfortunately, as presented by the authors, it is not a simple methodology with universal procedures, but an approach or discipline with core values and principles which are applied by various practitioners in differing ways in diverse situations.

The research of Cicmil and Hodgson centers upon the development of new forms of project management practice, training and education that are better able to apprehend social complexity, power relations and tacit knowledge and self-reflexive practice (CICMIL et al., 2006; HODGSON; CICMIL, 2006, 2007, 2008). These works were also a inspiration for the the one here presented.

The idea is not only dedicate to the craft knowledge or bottom up knowledge that surfaces from the reflection, putting aside all processual knowledge. Contrariwise, we intend to make the knowledge flow both sides. And help practitioner use their tacit knowledge more appropriately. Giving them new instrumental for rethinking and evolving, not focusing only in cost, time, scope and quality objectives. Like pointed out by CICMIL (2006):

> The thought, body, knowledge and action are inseparable, are simultaneously forming and are being formed by one another. Project management education should enable the development of concrete, context-dependent knowledge by encouraging reflective participative understanding of organizational processes as circular complex responsive process of conversational and power relating.

Reflexivity is often presented as the key strategy to overcome theory-practice gaps within project management (CRAWFORD; POLLACK, 2007; CRAWFORD et al., 2006; CRAWFORD, 2006). Notable reflexive strategies include critical discussions by practitioners of extant best practice solutions (CRAWFORD et al., 2006).

SAGE; DAINTY; BROOKES (2010) address a common reflexive understanding of knowledge developed across a divergent group of authors and address extant thinking about practice, rather than provide an instant contribution to project management practice. Although, the authors argue that, while this new path of project management thinking appears fresh, it could be considered as an approach to knowledge creation that is actually traditional both in its intellectual origins and scope for creating new knowledge.

ESKEROD (2010) presents a case study in Denmark, it intended to contribute to the understanding of challenges related to further develop project management competencies in a company, by involving project managers in action learning in a competence development program. The authors also presented a proper and respected set member selection process, proper training of facilitators, sufficient time spent on each action learning session, and sufficient followup. The organization in this case, was one of the largest and oldest consultancies in the

field of engineering in Denmark, a global player with a workforce of more than 7500 people. Once again we see effort to help large organizations, not small ones, not at least on project management.

To end this brief summary, we point out MENGEL; THOMAS (2004)'s work, that explicitly states what we are aiming at: support continuous change, creative and critical reflection, increasing self-knowledge, as presented in the quote bellow.

> Current models of project management practitioner development continue to focus on transferring "know what" based on the bodies of knowledge, programs delivered in traditional learning environments that emphasis instruction and training. And to address the implications of changing we need more emphasis on educational models that facilitate development of "know-why" and "know-how" that will enable practitioners to select appropriate combinations of knowledge, practice and behaviors that will support and foster continuous change, creative and critical reflection, self-organized networking, virtual and cross-cultural communication, coping with uncertainty and various frames of reference, increasing self-knowledge and the ability to build and contribute to high performance teams (MENGEL; THOMAS, 2004).

We could also mention from the agile methods, the lessons learned, retrospective (SCHWABER, 2004), but it all came after Schon's reflection on action (SCHÖN, 1983).

2.8 Micro and Small Enterprises

In Brazil, there is not a single definition that characterizes Micro and Small Enterprises (MSE). The main criteria for this characterization is related to the annual revenue or number of employees.

In SIMPLE[2], these values changes to up to R$ 240,000.00 (around USD 70,000.00 for micro) and up to R$ 2,400,000.00 (around USD 700,000.00 for small). For the Ministry of Science and Technology (MCT), the two criteria were adopted. And also micro enterprises are characterized by a workforce of up to 9 employees and annual revenues of up to R$ 1,200,000.00 (around USD 345,000.00), while small businesses are characterized by a work force from 10 to 49 employees and annual revenues from R$ 1.2 million to R$10,500,000.00 (from around USD 345,000.00 to around USD 3,004,006.47).

This definition varies from country to country. In Brazil, there is a supplementary Law for micro, small and medium organizations. Law number123/06 defines the size of organization by its annual gross revenue (SUPPLEMENTARY LAW 123/06, 2006). It is the recognition of the importance of an economic segment that brings together 99.2% of all companies in the

[2]Integrated System for Taxes Payment and Contributions for Micro and Small Businesses

country, nearly 60% of jobs and 20% of Gross Domestic Product (GDP). Not to mention the window of opportunity that is opened for the settlement of more than 10 million companies living in informality (SUPPLEMENTARY LAW 123/06, 2006). Table 2.4 shows the revenue for small organizations. It was in this scenario, of micro and small software development organizations, that the approach to understanding the software projects actuality has been used. Whereas Figure 2.10 presents the definition micro, small and medium-sized organizations according to of European Union (COMMISSION et al., 2003).

Table 2.4: Organizational size by 123-06 Brazilian supplementary law.

Size	Annual Gross Revenue
Micro Organization	Up to R$ 360,000.00
Small Business	From R$ 360,000.01 to R$ 3,600,000.00

SARFATI (2013) affirms that according to the nomenclature used by Canadian Ministry of Industry, the organization size is the rated according to the number of employees. Up to four is micro, between five and 99 small and from 100 to 499 employees medium. The authors affirm that according to data from Statistics Canada, about 90% of MSMEs (Micro, Small and Medium Enterprises) bill less than $ 500,000 a year. Canada has been seeking to promote the formation of regional high-tech clusters (there are 11 at the time), the development of these clusters also fulfill the government's objective of reducing regional inequalities through the development of high value-added activities. In fact, the partnership with universities is essential for the presence of education and research excellence centers. Sarfati also points out that in Chile, considering Chilean government classification, micro-enterprises are those with US $ 106,700 in revenue per year and small, those with $ 1.11 million dollars. In Italy, according to the European Commission's classification, micro-enterprises are considered those with fewer than 10 employees and less $ 2 million in revenues. And small businesses are those with fewer than 50 employees and annual revenues up to $ 10 million.

Size of Organization	Employees	AND	Billing (Million €)	OR	Total Assets (Million €)
Micro	<10	and	≤ 2	or	≤ 2
Small	<50	and	≤ 10	or	≤ 10
Medium	<250	and	≤ 50	or	≤ 43
Large	>250	and	> 50	or	> 43

Figure 2.10: European Union definition of MSMEs (COMMISSION et al., 2003)

Brazilian Information Technology domestic market, which includes hardware, software and services, handled 60.2 billion dollars in 2012, representing 2.67% of the Brazilian GDP.

Of this, 9.5 billion came from the software market and 15.5 billion from the services market (BRAZILIAN SOFTWARE MARKET: SCENARIO AND TRENDS, 2013). The Brazilian software industry has increasingly sought to specialize and increase their ability to survive in the competitive global market. Among the companies dedicated to software development, production or software distribution and services, over 85% companies can be classified as Micro or Small Business, according to research published by Brazilian Association of Software Companies (BRAZILIAN SOFTWARE MARKET: SCENARIO AND TRENDS, 2013). Table 2.5 presents the annual revenue distribution, helping to understand the relevance of small organizations in the Brazilian software development business. During the study, the market value of the US Dollar against the Brazilian currency (R$ Real) considered for this research was rated R$ to USD$: 2011 - 1.674; 2012 - 1.955.

Table 2.5: Annual revenue distribution - R$.

Thousands of reais	**% Organizations**
Up to 1000	57%
From 1001 to 2000	21%
From 2001 to 4000	8%
From 4001 to 10000	6%
More than 10001	8%

In this context, although the MSEs currently represent about 20% of national GDP, 99% of Brazilian companies, 51.6% of non-agricultural formal jobs generated in Brazil and almost 40% of the salary of the country mass (SEBRAE, 2011), it still presents a serious problem that affect organizational performance. Wherefore, MSEs represent a viable and concrete alternative to strengthening a country's economy, as they have an extremely important role in generating jobs. Besides of course its role in social mobility, if you consider the ones in smaller cities, like two organizations in our sample.

For this PHd work we recognize that seven out of eight meet the criteria of Law number 123/06 related to its annual gross revenue (SUPPLEMENTARY LAW 123/06, 2006). Only the small team, inside a non software organization, would not meet this criteria. Even though we adopted MCT's criteria. This decision was made because software activities are highly dependent on people's extensive involvement. And also because not all organization liked to open their annual revenue to the research team in the beginning of the work.

It was in this scenario, of small software development organizations, that the approach to understand the software projects actuality had been used.

2.9 Closing Remarks

This chapter presented the main theoretical basis concepts of this thesis proposal. All topics are related with some part of the research or its motivations. In order to understand each concept, we invested on a literature review.

The first step was the review on the evolution of project management. From the project management prehistory until nowadays. Even tough most of the aspects were not exhibited, the main concepts were presented. A brief summary about the most significant maturity and capacity models, related to this work was also presented. The Maturity models literature review and analysis was deeper but only the objective of each model was presented. Books and norms which generate information to support project management were also analyzed. These themes contributed to support, guide, and serve as reference to our research. Among all the models and references, the most unknown to the team members in our sample was ICB (ASSOCIATION et al., 2006). Concepts associated with leadership and team building was an important theory used along the reflections.

Moreover, we presented related works and concepts associated with project actuality, action learning and reflective practitioner, all main ideas and concepts related to this proposal. Some of the works had a great deal of importance to the proposed approach, stands out CICMIL (2006) for the introduction of the project actuality concept, LALONDE; BOURGAULT; FINDELI (2012) and SCHÖN (1983). The last one much as an inspiration for the reflection activities.

From the body of knowledge and models, stands out ICB from IPMA (ASSOCIATION et al., 2006), PMBOK (INSTITUTE, 2013) and MR-MPS-SW (SOFTEX, 2012). All of them used as theory foundation for data analyses and to support team reflections.

Indeed, little has been said about how to use all this models and references in small software development organizations. Although this thesis does not solves this gap, it helps the understanding of the scenario by defining and using an approach to analyze and understand project actuality in MSEs.

3

Research Method

If you talk to a man in a language he understands, that goes to his head. If you talk to him in his language, that goes to his heart.
- Nelson Mandela

Research can be described as a systematic inquiry, whereby data are assembled, analyzed and interpreted in order to understand, describe, predict or control a phenomenon, or to empower individuals or communities (MACKENZIE; KNIPE, 2006).

Scientific method is necessary to make the research results more reliable and reproducible by other researchers, among other reasons. A well-defined methodology reduces bias (KITCHENHAM, 2007). This chapter will discuss the chosen method appropriateness in relation to the research subject area, and explain the wider considerations leading to the adoption of this research methodology strategy and its methods. This chapter also presents the methodological approach selected for this work, which includes research classification, the methods, the methodology strategy with its various stages that guided this research. The research design for the multiple case studies will also be presented.

3.1 Research Classification

In order to reach the expected results, this research used a constructivist paradigm and adopted an inductive strategy of inquiry based on qualitative data. The chosen method was descriptive case study, supported by ethnographic techniques. Other essential methods for the research conduction were an Exploratory Review (SCHUETZENMEISTER, 2010) and a Systematic Literature Review (SLR) (KITCHENHAM, 2004, 2007), source to the approach elaboration. In addition, action research was used to help enhancing the actuality observed and analyzed by the approach in each case studied.

Constructivist paradigm concentrates on understanding how different people make sense of the world, and how they assign meaning to actions (EASTERBROOK et al., 2008). In such studies, scientific knowledge is attached to the context from where it was created. Constructivist prefers methods that collects rich qualitative data about human activities (CRESWELL, 2013).

As this research intend from the beginning to study, analyze, describe and explain real-world phenomena, the qualitative approach was the chosen one. Besides, we are dealing with phenomenon that needs to be explored since little research has been done on it.

Qualitative approach may be needed because the topic is new, the subject has never been addressed with certain sample or group of people, and existing theories do not apply with the particular sample or group under study (CRESWELL, 2013). Creswell also points out that qualitative research is an approach for exploring and understanding the meaning that individuals or groups assign to a social or human problem. Great to our necessity to understand project actuality, the meaning that every team member ascribe to its relations, external and internal influences, problems, threats and daily routine. The author also states that qualitative research's process involves:

- Emerging questions and procedures;
- Data typically collected in the participant's settings;
- Data analysis inductively building from particulars to general themes;

  > "Those who engage in this form of inquiry support a way of looking at research that honors an inductive style, a focus on individual meaning, and the importance of rendering the complexity of a situation (CRESWELL, 2013)."

- The researcher making interpretations of the meaning of the data.

According to BOGDAN; BIKLEN (1998) qualitative researchers analyze their data inductively. They do not set out to find data to prove or disprove hypotheses that they had prior to their study. Their theories come from the "bottom up" rather than the "top down". The qualitative researchers' theory is grounded in the data. The theory emerges as a piece of art that is yet to be created, rather than a puzzle where the image is already known. Things are more open at the beginning and more directed and specific at the bottom. It is in the first part of the qualitative research where the qualitative researcher discovers important questions. According to the authors, he or she does not assume to know the important questions prior to beginning their research.

Inductive or ground up means the process of first identifying phenomena at the variable level and the situating them within the proper sub factor, factor and domain (SCHENSUL, 1999). Characterized by starting from a particular data set, sufficiently recorded, to infer a general fact, not necessarily contained in the examined portions (MARCONI; LAKATOS, 2000). Marconi and Lakatos also point out that the application of inductive approach method is divided into three steps:

- Phenomena observation;

- Relationship discovery; and
- Conclusions generalization.

A case study is a specific instance that is frequently designed to illustrate a more general principle (BELL; GOULDING, 1984) *apud* (LOUIS; LAWRENCE; KEITH, 2007). Yin (YIN, 2014), defines a case study as being an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly defined. About case studies, LOUIS; LAWRENCE; KEITH (2007) state that:

> It provides an unique example of real people in real situations, enabling readers to understand ideas more clearly than simply by presenting them with abstract theories or principles. Case studies can establish cause and effect, indeed one of their strengths is that they observe effects in real contexts, recognizing that context is a powerful determinant of both causes and effects. Further, contexts are unique and dynamic, hence case studies investigate and report the complex dynamic and unfolding interactions of events, human relationships and other factors in a unique instance.

The authors complement that case studies (LOUIS; LAWRENCE; KEITH, 2007):

- will have temporal characteristics which help to define their nature have geographical parameters allowing for their definition;
- will have boundaries which allow for definition;
- may be defined by an individual in a particular context, at a point in time;
- may be defined by the characteristics of the group;
- may be defined by role or function;
- may be shaped by organizational or institutional arrangements; and
- data are gathered systematically and rigorously.

There are several types of case study. YIN (2014) identifies three types in terms of their outcomes:

- Descriptive: This type of case study is used to describe an intervention or phenomenon and the real life context in which it occurred;
- Explanatory: This type of case study would be used if you were seeking to answer a question that sought to explain the presumed causal links in real life interventions that are too complex for the survey or experimental strategies. In evaluation language, the explanations would link program implementation with program effects;

- Exploratory: This type of case study is used to explore those situations in which the intervention being evaluated has no clear, single set of outcomes.

Unlike the experimenter who manipulates variables to determine their causal significance or the surveyor who asks standardized questions of large, representative samples of individuals, the case study researcher typically observes the characteristics of an individual unit (a child, a clique, a class, a school or a community) (LOUIS; LAWRENCE; KEITH, 2007). The authors state that the purpose of such observation is to probe deeply and to analyze intensively the multifarious phenomena that constitute the life cycle of the unit with a view to establishing generalizations about the wider population to which that unit belongs.

In this thesis, we adopted a descriptive case study, observing the characteristics of MSEs ands its teams, seeking for the comprehension and the description of the phenomenon.

Case studies can be divided into two additional sub categories depending on how the case is analyzed, either it is holistic, or embedded (BAXTER; JACK, 2008). A holistic case study is a case study that reason about the global phenomenon, and tries to draw conclusions about the phenomenon as a whole. According to Baxter and Jack, an embedded case study instead draws conclusions about the phenomenon by investigating or analyzing sub-units of the study object. Multiple cases studies may consist of both holistic and embedded cases, a heterogeneous design.

Since there is no single case that can properly and definitely describe the phenomenon that seeks to understand (decisive case) or it can be understood as a developer case, the choice lies with the study using multiple cases (YIN, 2005) *apud* (REINEHR, 2008).

The use of multiple cases studies yields more robustness to the conclusions from the study (YIN, 2014; GRAY, 2013). As presented by Reinehr (REINEHR, 2008), besides getting deeper discovery on the phenomenon studied, the multiple cases contributes substantially to the generalizations procedure.

YIN (2014) describes how multiple case studies can be used to either, predict similar results (a literal replication) or predicts contrasting results but for predictable reasons (a theoretical replication). This type of a design has its advantages and disadvantages. Overall, the evidence created from this type of study is considered robust and reliable, but it can also be extremely time consuming and expensive to conduct (BAXTER; JACK, 2008).

According to BENGTSSON (1999), the literal replication means that the cases selected are similar and the predicted results are similar too. The author also states that the theoretical replication means that the cases are selected based on the assumption that they will produce contradictory results.

This research has six cases studies executed along three years. Among the six, there are micro and small organizations from two cities. Following this idea of producing contradictory or different results, there are MSE with agile process, traditional process and no process at all. SME that focused in product maintenance and/or software houses, software development for sites and organizations that focused in the government as its main client. The analysis from each individual case study is presented in Chapter 6, the combined analysis in presented in Chapter 7.

By observing and using ethnographic techniques during the case studies, we identified patterns in each organization or team or project emerging from the collected data signalized by codes. By the relationship discovery, we mean the identification of culture, events, problems and actions that generated the pattern, the indicators. Codes, patterns and indicators can also be grouped to explain part of the phenomenon. At last, by generalization conclusions we mean the analysis of the research's findings, the synthesizes, the conclusions of the causalities for each context ("In organization A, it is possible that Y caused Z"). Although by generalization we do not mean that findings from one organizations will represent all population of small software development organizations. The generalization is a part of the inductive method, and in our research it is context dependent. However, maybe it will serve as an alert for those living or studying the entire population.

We adopted multiple case studies to promote the richness and depth on the project actuality's phenomena study, enabling to compare and contrast the results from the multiple cases. Moreover, in order to validate and enhance the approach. By definition, our design for the multiple case studies is holistic and embedded.

Along this research, this combination of methods and techniques were applied in several moments. In resume, Table 3.1 presents the methodological board that states the research paradigms and strategies for inquiry.

Table 3.1: Methodological Approach Board. Source: own elaboration.

Classification	**Method or Approach**
Research Paradigm	Constructivist
Technical Procedure	Exploratory Review, Systematic Review
Variables Nature	Qualitative
Strategy of Inquiry	Inductive process
Method of data Collection	Descriptive Case Studies, with ethnographic techniques, followed by action research
Data collection instruments	Participant observation, Interviews, documents review and analysis

In the next section, the research strategy aligned with the methodological approach will be presented and explained.

3.2 Research Strategy

In order to reach the objective previously described, a research strategy was proposed based on Farias Junior' methodology (FARIAS JÚNIOR, 2014) that in turn was inspired by Dias-Neto, Spiniola and Travassos research strategy (DIAS NETO; SPINOLA; TRAVASSOS, 2010). The general research strategy is presented in Figure 3.1. It presents all the phases this research went through.

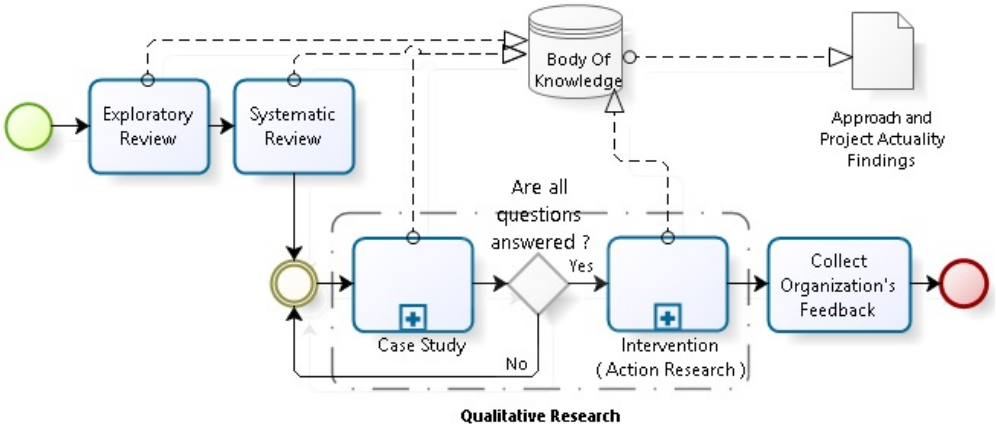


Figure 3.1: Methodology strategy, based on Farias Junior' Methodology (FARIAS JÚNIOR, 2014)

3.2.1 Phase 1: Exploratory Review

According to GRESSLER (2003), in order to succeed in an investigation, the researcher must already have previous knowledge about the subject. Therefore, to ensure a better understanding of research aspects, such as project management, qualitative research and project actuality and to build a background, an exploratory review (RANDOLPH, 2009; SCHUETZENMEISTER, 2010) was conducted.

This phase's results are presented in Chapter 4. The first version of the approach, related to the thesis idea, assumptions an objectives was presented in the doctoral symposium in August 2014 (SAMPAIO; MOURA, 2014) and in a Project Management Conference (ProjMan) (SAMPAIO; MARINHO; MOURA, 2014a).

3.2.2 Phase 2: Systematic Literature Review

A general trend toward more evidence based software engineering (KITCHENHAM, 2004) has lead to an increased focus on new, empirical and systematic research methods. During an exploratory review, as mentioned in the previously phase, the strategy and the selection criteria are not transparent to the reader. A systematic review is a defined way of identifying, assessing and analyzing published primary studies in order to investigate a specific research question (KITCHENHAM, 2004; STAPLES; NIAZI, 2008). It provides the means to identify, evaluate and interpret all available research relevant to a particular research question, topic area and phenomenon of interest (KITCHENHAM, 2007; PETTICREW; ROBERTS, 2008). It is a planned and ideally repeatable way of synthesizing results from the existing body of scientific literature.

The systematic literature review was performed between October 2012 and January 2013. It aimed at identifying the theory associated with project actuality phenomenon as well as to examine how academics and organizations are analyzing it. The resume of the systematic review

and its results is briefly described in Chapter 4.

After the execution of the SLR, it was possible to conclude the final version of the approach. In the beginning of 2014, the SLR and its results were complemented to include year 2013, formalized and than published in (SAMPAIO; MARINHO; MOURA, 2014b).

3.2.3 Phase 3: Qualitative Research

The methods and techniques for collecting and analyzing data can be grouped into two sets: quantitative methods and qualitative methods (CRESWELL, 2012). In fact, different methods enable the researcher to gain access to different types of knowledge based on different variables.

Variable can be defined as any attribute or characteristic that has influence in the studied phenomenon (GODOY, 1995). Some examples are: design effort; average years of experience of the project; number of people on the team; phenomena related to day to day software projects like situation; context; and others. The appropriate classification of the variable to be studied is needed since the technique is directly related to the variable type in question. Variables can be classified as quantitative or qualitative.

Quantitative is used when the variable is always expressed in numbers, such as lines of code, effort and related. Quantitative research methods involve the collection and analysis of numerical data and are strongly supported by statistics.

According to Godoy (GODOY, 1995), qualitative research neither seeks to enumerate and/or measure the events studied, nor employs instrumental in statistical data analysis. It comes from issues or interests of large outbreaks, that will be defined as the study progresses. It involves obtaining data about people, places and interactive processes by direct contact between the researcher and the situation studied, trying to understand a phenomena from subject's perspective, that means, from the field study participant situation. In order to understand and analyze project actuality phenomenon, qualitative research methods were chosen.

CRESWELL (2012) points out five types of qualitative methods: narrative survey, phenomenological research, research with Grounded Theory, ethnographic research and research based on case study. We chose to work with case study, with the help of some ethnographic techniques. Besides, after researching the case, in order to help organizations overcoming some observed problems, action research was conducted during interventions in all organizations in the sample.

The study of software engineering has always been complex and difficult (SEAMAN, 1999). According to Seaman, the complexity arises from: Technical issues; The awkward intersection of machine and human capabilities; And the central role of human behavior in software development. Seaman affirms that the first two aspects have provided more than enough complex and interesting problems to keep empirical software engineering researchers engaged up until now. But it is the last factor, human behavior, that software engineering empiricists are

only recently beginning to address in a serious way. The adoption use of ethnographic techniques within a case study helped the understanding of the human behavior.

Analyzing qualitative data is often seen as a demanding, repetitive and arduous task. Although predominately a mechanical exercise, it requires certain abilities. The researcher must be dynamic, intuitive and creative, must be able to think, reason and theorize (BASIT, 2003). That is the goal of the plan after returning from each observation, interview, or other research session. The researcher must write what happened and listen to what was recorded, if it was recorded. All the description on team members, owners, places, events, phone calls, activities, and conversation must be taken and written in the notes. In addition, as part of such notes, we produce memos, notes with codes, strategies and reflections of patterns that emerge. Besides, for the last three organizations, Atlas.ti[1] was used to help data organization an future analysis.

3.2.3.1 Phase 3-1: The case study

As already mentioned, we adopted multiple descriptive case studies. Aligned with the approach defined in this thesis, ethnographic techniques were included as strategy for the beginning of the case study to enrich the data collected.

YIN (2014) and EISENHARDT; GRAEBNER (2007) recommend having more than one case study as these will serve to replicate, contrast or extend theory development. In a multiple case study, authors examine several cases to understand the similarities and differences among the cases (BAXTER; JACK, 2008). A multiple case study enables the researcher to explore differences within and between cases. The goal is to replicate findings across cases. Because comparisons will be drawn, it is imperative that the cases are chosen carefully so that the researcher can predict similar results across cases, or predict contrasting results based on a theory (YIN, 2014). We adopted multiple case studies to promote the richness and depth on the project actuality's phenomena study, enabling to compare and contrast the results from the multiple cases. Moreover, in order to validate and enhance the approach as well as to be able.

MASON (2002) advocates the integration of methods, for several reasons:

- to explore different elements or parts of a phenomenon, ensuring that the researcher knows how they interrelate;
- to answer different research questions;
- to answer the same research question but in different ways and from different perspectives;
- to give greater or lesser depth and breadth to analysis; and
- to triangulate (corroborate) by seeking different data about the same phenomenon.

[1] Version 7, http://atlasti.com/

Among the qualitative methods, ethnography help the observation and understanding of the context, the project actuality of small software development organization. Nowadays ethnography is widely used as a tool in researches that involve social factors (ROBINSON; SEGAL; SHARP, 2007). According to Oxford Online Dictionary[2], Ethnography is the scientific description of the customs of individuals and the culture of the people. Schensul presents ethnography as a scientific approach to discovering and investigating social and cultural patterns and meaning in communities, institutions, and other social settings (SCHENSUL, 1999).

EASTERBROOK et al. (2008) argues that ethnographic studies in software engineering are valuable for discovering what really goes on in particular technical communities, and for revealing subtle but important aspects of work practices. It is a form of research focusing on the sociology field through observation and it can help understand how technical communities build a culture of practices and communication strategies that enables them to perform technical work collaboratively. The notion of fieldwork, which is central to ethnographic approaches, emphasizes the researcher's presence in the field, and even assumes the researcher's integration into the observation field (PATTON, 2005).

Ethnography seeks to understand practice in its own terms, minimizing the impact of the researchers' own backgrounds, prejudices and assumptions (ROBINSON; SEGAL; SHARP, 2007). According to GENZUK (2003) ethnography is a method to look very closely, which is based on personal experience and participation. It involves three forms of data collection: interviews, observation and documents. Successively, it produces three types of data: quotations, descriptions and excerpts of documents, resulting in a single product: a narrative description. This includes graphs, diagrams and artifacts that help tell "the story".

In terms of the data collection, ethnography usually involves the researcher participating overly or covertly in people's daily lives for an extended period of time. Watching what happens, listening to what is said, and/or asking questions through informal and formal interviews, collecting documents and artifacts — in fact, gathering whatever data are available to throw a light on the issues that are the emerging focus of inquiry (HAMMERSLEY; ATKINSON, 2007). Endorsing the multiple data collection means, already mentioned in the Table 3.1.

In this step of the research strategy, we intended to collect, analyse and understand the data. Therefore, case study with ethnographic techniques was chosen. We believe that to achieve a true inquiry of project actuality, it is not enough to simply observe different moments of the team together. We must observe the environment and the context. It shows that we need to find ways, means, reasoning for the decisions, actions and relations, motivations, reasons of actions, problems decisions, culture and skills. And how those impact in the relations, project success, long term effect and short term effects and in the results of the observed activities. And to accomplish that, this is the most accurate method.

The research design for the multiple case studies is presented in section 3.3.

[2]http://www.oxforddictionaries.com/

3.2.3.2 Phase 3-2: Action Research - Interventions

In experimental research, the researcher manipulates the independent variable. Either he has control over the independent variable, or consciously manipulates this variable, analyzing later on, its effect on the dependent variable (POLIT; HUNGLER, 1995). BASILI (1996) affirms that, the experimental paradigms involve an experimental design, observation, data collection and validation on the process or product being studied. The approach designed in order to carry the studies considers all of these aspects and strategies, and it is concluded within a step of Action Research (AR).

In this phase of the research strategy, all case studies were already executed and project actuality and its grounded data identified and analysed. In order to help the organizations in overcoming it problems, we planned interventions based on the case studies data. This step was not planned from the beginning, but after the first two case studies the strategy was adapted as well as the approach to include (AR).

(AR) can be defined as:

> "Kind of a social research with experimental basis that is conceived and conducted in close association with an action or a collective problem resolution where researchers and participants are involved in a cooperative way" (THIOLLENT, 2011).

Definition also similarly advocated by other authors (POLIT; HUNGLER, 1995; LAU, 1999; DAVISON; MARTINSONS; KOCK, 2004). DAVISON; MARTINSONS; KOCK (2004) complement the definition as "an iterative, rigorous and collaborative, involving a focus on both organizational development and the generation of knowledge".

According to ZELKOWITZ; WALLACE (1997), the social challenges dealt by researchers in Software Engineering investigations make action research an useful method due to its characteristics and possibility of obtaining relevant results. POLIT; HUNGLER (1995) presents action research as a type of social research, empirically based, which is designed and carried out in close association with an action or collective problem resolution. Researchers and representative participants of the situation or problem are involved in cooperative mode or participating.

In this thesis, we worked with micro and small software development organizations, and followed the premises pointed by AR most common definition, as stated in (LAU, 1999; DAVISON; MARTINSONS; KOCK, 2004):

> "AR assists in practical problem solving; expands scientific knowledge; enhances actor competencies; is performed collaboratively in an immediate situation; and uses data feedback in a cyclical process. A great possibility to re-analyze moment, aspects and re-prioritize elements or problems".

While most empirical research methods attempt to observe the world, as it currently exists, action researchers aim to intervene in the studied situations for the explicit purpose

of improving the situation (EASTERBROOK et al., 2008). Easterbrook, Singer, Storey and Damian also state that action research is most closely associated with critical theory and it is normally taken as self-evident that the problem needs to be solved, and that the adopted solution is desirable. The knowledge gathered from research empowers particular individuals or groups, and facilitate a wider change. However, AR can be linked to other philosophical stances by divorcing it from its emancipatory roots, and focusing instead on practical problem solving. Whether on the one hand positivists would add a concern with careful comparison of the "before" and "after" situations, on the other hand constructivist would focus on participants' perceptions of the change process (EASTERBROOK et al., 2008).

The AR's application focus involves solving organizational problems through interventions, while at the same time contributes to teams and organizational knowledge. In our studies, we had the purpose of improving the organizations and its teams, by overcoming their problems and helping team members to engage in reflection. The constructionist's view of participant's perception and evaluation was what really mattered, even though team's competencies, knowledge, and reflection expertise were also analyzed.

DAVISON; MARTINSONS; KOCK (2004), suggests a unidirectional flow, with diagnosis followed by planning, intervention, evaluation and reflection as presented in Figure 3.2. These authors also claim that while this is a desirable flow, their experience suggests that some iteration between stages may be needed, and if so, the report must detail it. Figure 3.2 depicts this flow.

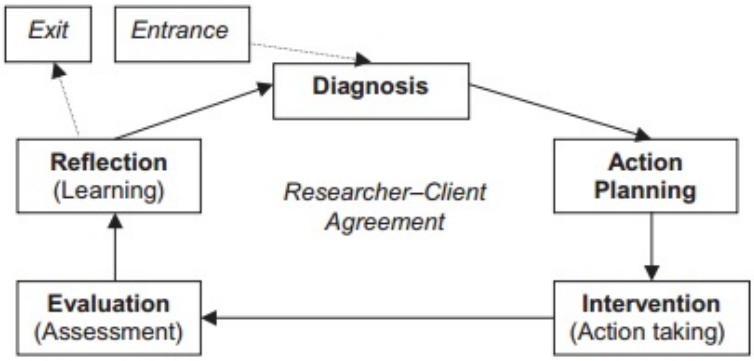


Figure 3.2: Cyclical Action Research Process Model (DAVISON; MARTINSONS; KOCK, 2004)

In order to better suit the scheme for small organization and for teams' reflection, rethinking and learning, the scheme was adapted, based on our own practical experience. All the activities purposes were carried out but in a different order and sometimes with different proposes. In our approach, the Diagnosis was replaced by the research setup and the ethnographic study. In this stage the research field was defined, an agreement was settled and the problems were analyzed by the ethnographic study, similar to Davison, Martinsons and Kock's proposal. The Action Planning stage uses the same idea as the one presented by the authors, where actions are defined for the diagnosed problems, although we included a re-prioritization in each cycle,

accommodating new prioritized-disturbing problems.

Intervention corresponds to the planned actions implementation exactly as idealized by the author (DAVISON; MARTINSONS; KOCK, 2004). The biggest adaptation is surrounding the Reflection activity; it does not only support the information flow between participants and the organization as presented by Davison, Martinsons and Kock. As we deal with small organization, most organization's member were involved as researchers in action and just one organization (*B*) needed to make the information flow, all the others had all team members engaged and involved. In our studies, reflections occurred before Action Planning, as presented in Figure 3.3. After the intervention, the Evaluation took place, following the authors' idea of using theoretical support to analyze actions' effects and results. It was followed by another cycle started by reflection and learning activity. This adaptation is part of the approach and the reflection stage will be explained later on in this thesis, when explaining the approach.

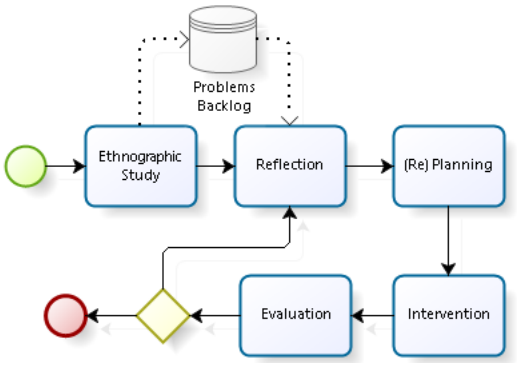


Figure 3.3: Action Research Strategy (SAMPAIO et al., 2015). Source: own elaboration.

After several weeks of ethnography, once the researcher was already integrated to the field and the trust was gained, the action research took place. The interventions, based on action research, happened several times along each project or situation along the studies, leading into continuous and constructive process of reflecting and learning. It will be presented in Chapter 6.

The entire idea of engaging in reflection is to help the team to use their knowledge, skills and change the attitude towards a *status quo*, based on a specific situation, project context or aspect. Although it is imperative to exchange knowledge with the academy. Figure 3.4 presents this mentality.

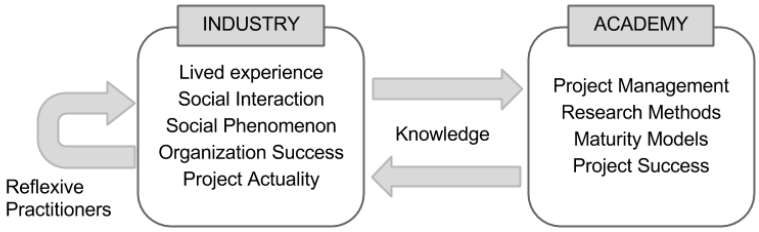


Figure 3.4: Knowledge flow through reflection and rethinking. Source: own elaboration.

3.2.4 Phase 4: Collect Organizations' Feedback

After the end of the work, and also when the group of problems were overcame, the organization was invited to evaluate the approach and the results that came with it, by giving their feedback. The feedback is presented along the findings.

3.2.5 Building the approach

After the the exploratory and along the systematic review, the first version of the approach was concluded, considering ethnographic techniques, documentation analysis and interviews among other tips to help observe and analyze project actuality. Moreover, it was the base for the first few case studies throughout 2012. The first version only intended to observe and analyze the project actuality. Although, after the first two case studies, it felt very frustrating to collect the data and leave the organization without any help or guidance.

The second version of the approach was created before ending the SLR. New techniques and tips were added to create this version that considered intervention with action research method. The second version was responsible for the case studies carried throughout 2013 and 2014. The first round of results and the second version of the approach were published under the title "An Approach to Understanding Project Actuality in Small Software Development Organizations and Contribute to Their Success" (SAMPAIO; MARINHO; MOURA, 2014a).

The final version of the approach has the cited conference (SAMPAIO; MARINHO; MOURA, 2014a) feedback and also the thesis qualification board suggestions incorporated. This last version was also evaluated in the last case study carried from February to June 2015.

3.3 Research Planning and Design

It is important to consider the additional components required for designing and implementing a rigorous case study. During the introduction we presented the first component, the propositions. Following the definition defended by YIN (2014) of research components for case study or sources of concern, this section will present the other four components left: development of the research questions; units of analysis; the logic linking data to propositions; and the criteria for interpreting findings. The author also states that propositions narrow the focus of the study and suggests that case study inquiry benefits from the prior development of theoretical propositions to guide data collection and data analysis. The plannings steps and these components will be presented along this section.

3.3.1 Research Questions and Propositions

In a qualitative study, inquirers state research questions, not hypotheses (CRESWELL, 2013). These research questions assume two forms: a central question and associated sub-

questions. The questions may address a description of the case and the themes that emerge from studying it (CRESWELL, 2013).

Two central questions were necessary. One addressing the defined approach, related with propositions 1-4 that will be analyzed after the multiple case studies' conclusion. And another to assess project actuality phenomenon, related with propositions 5-6 that will be analyzed for each case study. The critical questions are:

1. How does the use of an approach that analyzes and understands project actuality phenomenon can support MSE to enhance its project management practices?

2. How does project management work within project actuality in MSE?

Figure 3.5 presents research critical questions and propositions. Since the first four propositions are related to the approach, its complete analysis will only be able after the understanding of the project actuality phenomenon. For that all case studies and its analysis must be concluded. In order to collect the data that will allow the further analysis of propositions 1 and 2, that starts with "By understanding project actuality we can...", related to the approach efficiency, the following sub-questions where considered for each case study and related to the first critical question:

- What are the team and project characteristics?
- How politics and culture influences teams and/or projects?
- What external and internal factors influence the project and teams?
- What is the profile of the manager or leader?
- What does "project actuality" look like in these organizations?

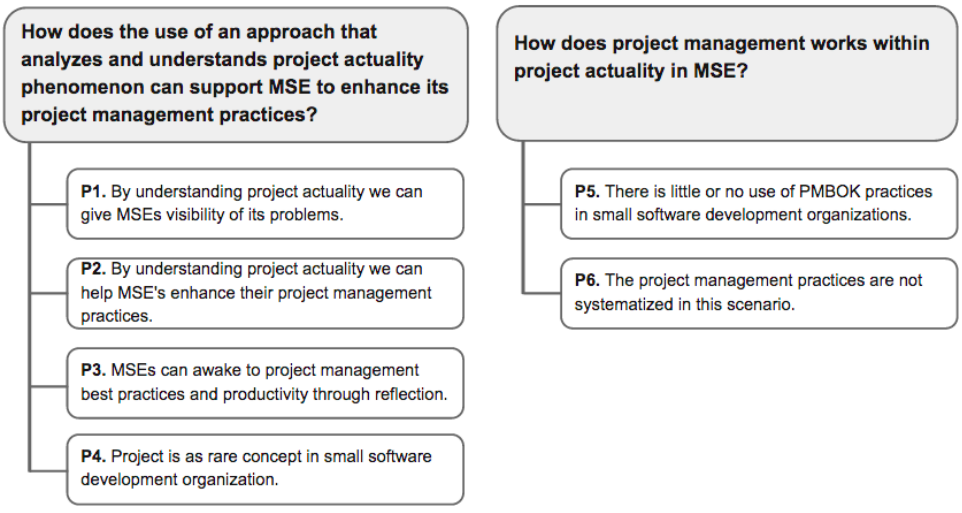


Figure 3.5: Research Questions and Propositions. Source: own elaboration.

In order to help detailing the propositions 5 and 6, the following sub-questions where considered for each case study and related to the second critical question:

- How adherent to PMBOK (PMI, 2008) are SME management practices?
- What practices and process from MR-MPS-SW (SOFTEX, 2012) are used among software practitioners in small development organizations?

PMBOK was chosen because we were investigating project management practices and this is a very known and popular reference on the project management literature. MR-MPS-SW was chosen because it is a Brazilian model, written and available in Portuguese and already in use by two organizations in the sample. As presented in Chapter 2, the focus of the model is to help SMEs meet its business necessities and goals. In addition, in its first level of maturity, it presents processes with project management practices. Useful to understand if the project management practices were systematized in the sample.

This research sub-questions, are also analysis drivers for each case study. Along Chapter 6 we present the answers to the aforementioned questions.

3.3.2 Units of Analysis

This third component is related to the fundamental problem of defining what the "case" is. In this research the organization or team to be studied and its members.

In the beginning of the research, there were three major criteria to include a organization in the sample:

- The organization must be a MSE;
- The researcher must have access to the project team.
- The organization must have enough room to accommodate the researcher.

In order to accomplish the research goal, and to guarantee that organizations' group had representativeness, the following extra criteria were add for the group:

- Be representative enough for the analyzed category including organizations with agile and traditional approach.
- Be representative enough including organizations that focus on software maintenance, product maintenance, as well as new software developments and solutions.

The organizations were chosen by convenience. At the beginning of research, the first author was involved in SoftexRecife's[3] research group. SoftexRecife supports micro and small

[3]The Software Technology Excellence Center in Recife, a civil non-profit association, established on Nov.8th,1994 with a mission to increase the competitiveness of ICT companies(http://www.recife.softex.br/)

software development organizations through training, process improvement, testing and other services. Five out of six organizations were associated with SoftexRecife. This linkage allowed the contact between researchers and organizations. All respondents willing to open their doors to this kind of research were welcome. The organizations that were not associated, were also indicated by SoftexRecife.

Among the candidate organizations, two were turned down due to the lack of infrastructure. One had distributed team members and the manager was not willing to involve them. The other one had no place to sit and be around the team. You cannot blend as similar if you have no place to sit. Besides, a huge turn over happened and it came to a complete change in the research field. A third organization was turned down after the beginning of the work due to its size. They were listed initially as a small organization, but their revenue would classify them as a medium organization.

3.3.3 Linking Data to Propositions and the Criteria for Interpreting Findings

According to YIN (2014), the actual analysis will require that you combine or assemble your case data as a direct reflection of your initial study propositions.

In order to follow the approach, the case studies also had the mission to understand the scenario, the phenomenon of project actuality. To accomplish that mission, all case studies were descriptive and used ethnographic techniques. The only analysis drivers were sub-questions to be used during interview steps and along the data analysis. After the first round of observations, new drivers emerged from data to be observed and analyzed. Since some models (PMBOK (PMI, 2008) and MR-MPS-SW (SOFTEX, 2012)) were used in this phase, its components and expected results were also helpful to link the emerged data to the propositions.

For each case, a general description, context and the analysis according to each sub-questions and emerged analysis drivers will be presented along Chapter 6. After every case, a final report and a findings presentation to the organization were made. In addition, the data was summarized and compared to the other cases. The propositions were once again analyzed according to the compared multiple cases data. Section 3.4 will detail the analysis drivers.

3.3.4 Obtaining the Authorization

Before starting the research, there is still a few last steps: the contact with the organization, sending and signing the invitation letter with the non-disclosure agreement (NDA), also known as a confidentiality agreement (Appendix A shows the template in Portuguese). This step consisted in obtaining authorization to conduct the study from the organization coordinator. This authorization was written as an invitation letter and a consent form to be signed by the organization high management, here called as site coordinator.

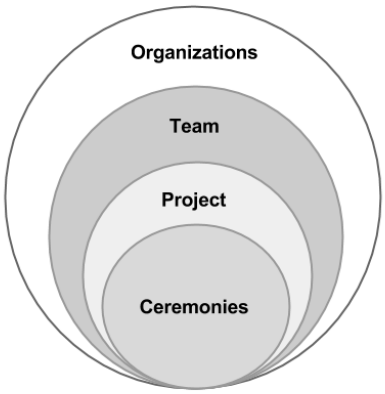


Figure 3.6: Ethnographic research strategy. Source: own elaboration.

All site coordinators were explained the scope of the study, the intention of staying inside the team's room, to participate in team meetings, the intention of analyzing their documentation. The idea of the agreement is to formally get permission to not only walk around the site, but to stick around and do the research. The agreement described briefly the study, its purpose, research methods, procedures, and adopted techniques. It also presented activities the study want to observe (such as technical and planning meetings), the kinds of things they want to see (such as documents and facilities). In this invitation letter the confidentiality agreement (it emphasis that no data would be attributed to the organization or a specific team) is explained along with the compensation and benefits for the participants, contact for information about the study and finally the consent form and the signature.

3.3.5 Other Design Steps

Conducting the Study

In order to conduct the study, there is also a research plan (Appendix B shows the template in Portuguese) to be produced in the first few visits. Along the research there is still the problem backlog to be delivered to the organization with the reflection triggers.

The Figure 3.6 presents the focus of the observation in different phases of the study. It intends to illustrate the passage from general observations focused on the organization, facilities, strategy, goals, processes and ecosystem, to a more narrow objective to the observations. Just when one level was understood, the new observation level was reached.

The second level of observation focused on the development team, their room, their agenda, leadership, relationships, dynamics, dependencies and problems. In a third observation level, we turned our focus to the project embraced by the team, its motivations, agenda, specific processes, customer and context. Finally, we attend only to some specific project teams events.

Even though the focus was in a different information level, once a deeper level was conquered, project level for example, it does not mean that we were not considering the bigger picture, for example the organization. In the given example, we were giving a greater focus to the project itself, its context and agenda within the given organization.

The ceremonies helped to focus on some specific situations and optimize researcher's time, besides indeed it have proven to be the main data sources to analyze project actuality.

The research plan only showed the first three levels of inquiry. Figure 3.7 presents the view presented for the team members, also included in the research plan.

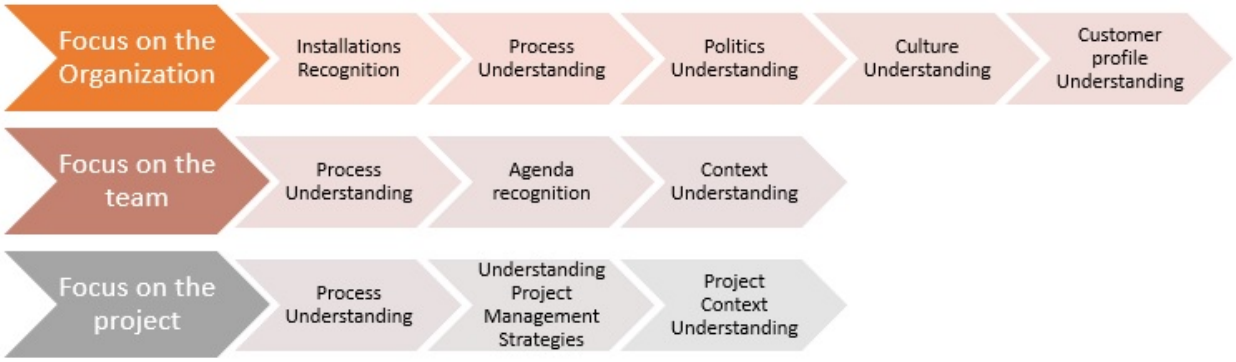


Figure 3.7: Level of inquiry presented to the team. Source: own elaboration.

Analysis and Formal Report

The final step is to transform all data, notes, logs, memos in a formal report. The data must be interpreted, and correlated to describe the observed project actuality. This report describes the organization characterization (site installations, the high management and team profile, product and client profile, organization process and culture), the proposition analysis along with other drivers analysis that emerged from the field, already will be explained in section 3.4.

Besides the case report, an overall case analysis report is also produced. The individual analysis is exhibit in Chapter 6.

3.4 Analysis Aspects

The research components based on case studies, reported by YIN (2014), includes aspects that researcher needs to stick to. According to the author, **linking data to the propositions** and **the criteria definition to interpret the findings**. The author reflects on the relevance of connecting data to propositions that in turn derives research questions, since it is from them that the conclusions may be obtained.

Along this section, it will be presented the analysis aspects that emerged from the field and the questions.

3.4.1 Analysis Aspect: Dimensions

In this section we briefly summarize the four dimensions covered by our studies and some of the questions we intended to answer. The dimensions were drivers that emerged from the the project actuality observations. It is important to enlighten the possibility that some answers are already published on the literature. But since we conducted a systematic review (SAMPAIO; MARINHO; MOURA, 2014b), it probably appeared in some other terms not related to project actuality.

Among the identified and analyzed dimension and their factors, there were:

- **Organization**: the nature of the company's business, the background experience, the customers, the process, governmental pressure, market pressure, owners position and pressure, the quality of the space and inside politics.
- **Team**: team's arrangements, cohesion, leaderships (or lack thereof), customers pressure, inside interventions and pressure, partnerships, motivations and agenda.
- **Individuals**: additional responsibility, the leader, the developer, and the multiple pressures exerted on the individual coming from their life, boss or coworkers.
- **Project**: methods, project dynamics, process-related aspects, references, client behavior (pressure, participation), effectiveness project management practice and the consistence with other methods.

The analysis of these dimensions and their factors are associated with the following sub-questions:

- "What external factors influence the project and teams?"
- "What does "project actuality" look like in these organizations?"

In order to help further collective data analysis, for each organization or team, we analyze if the factor was not represented or Absent (0), partially present or with medium impact (1) and present or that causes a high impact (2).

3.4.2 Analysis Aspect: PMBOK Adherence

One of the propositions was to In order to answer the research sub-question "How adherent to PMBOK are MSE management practices?", the data were analyzed to cross with the ten PMBOK's knowledge areas (INSTITUTE, 2013). Later it was presented to some interviewees, to be sure of the right actuality understanding.

Each knowledge area was analyzed from several aspects. At least one aspect in each process group (Initiating - In, Planning- P, Executing - I, Monitoring and Controlling - C) was considered. Only the closing process group was not mapped, since no formal closing project

activities were seen in any of the MSEs in the sample. Organization *D* was the only one that got close to what is really expected according PMBOK (INSTITUTE, 2013). For example, for the adherence of Project Stakeholders Management we considered:

- Initiation: Processes required to identify all people or organizations impacted by the project.
- Planning: Plan stakeholders management, Communications Management Plan.
- Implementation (Execution): Manage stakeholder engagement.
- Control: Control the stakeholder engagement, meetings and communications.

Our Analysis considered, according to PMBOK (PMI, 2008):

- Initiation was the recognition that a project or phase should begin and commit to it.
- Planning devising and maintaining the plan to accomplish the business need that the project was undertaken to address.
- Execution Process coordinates people and other resources to carry out the plan.
- Controlling the process ensures the project objective are met by monitoring and measuring progress and taking corrective actions when necessary.
- Closing is the formalization acceptance of the project or phase.

Once again we considered as not adherent or absent (0), partially adherent (1), and present or adherent (2), in order to help the combined analysis. As presented in the section 2.4.4, from Chapter 2, although everything was analyzed, one area and a few process were excluded or combined. Project Procurement Management Area was excluded because none of the organization used or did procurement.

3.4.3 Analysis Aspect: The Adherence to Project Management Process from MR-MPS-SW

This analysis followed the MA-MPS (WEBER et al., 2005) that in turn is based on (EL-EMAM; GARRO, 1999). MR-MPS-SW was chosen because the focus of the MR-MPS-SW Model is on SMEs that need to achieve significant improvements in software processes in a short time interval and with low costs (SANTOS et al., 2005). Since in SMEs, Software Process Improvement (SPI) deployment approaches require special concerns due to some constraints regarding material and human resources (SANTOS et al., 2007). Although this is a not process improvement study, the action research brought equivalent benefits.

This analysis intend to answer the following research sub-questions:

- "What practices and process among MR-MPS-SW (SOFTEX, 2012) are used among software practitioners in small development organizations?"
- "How project management is practiced in MSE?"

3.5 Closing Remarks

In this chapter we presented the methodology approach, methods and procedures. This study aimed on contributing to the project management area, documenting the project actuality in software development organizations, as well as contributing for the Software Engineering based on evidence.

By using case study method with ethnographic techniques, we identified patterns in each organization, team, and project emerging from the collected data signalized by codes. Not only focusing on effects, but on all the context from the emerged problem. The causalities emerge from data, some of them with the help of a qualitative research tool (ATLAS.Ti)[4].

The approach proposed from systematic and exploratory review also used action research, to deal with the problems. The action research application focused on solving organizational problems that emerged throughout the case studies, through interventions. While at the same time, contribute to teams and organizational knowledge creation.

This chapter aim was to present well established research strategies and describe them, making them possible to be reproduced by other researchers.

[4] http://atlasti.com/

4

Systematic Literature Review

Those who fall in love with practice yet without science are like a sailor who steers a ship without helm or compass, and who never can be certain whither he is going.
- Leonardo da Vinci

In this chapter we present a summary of the Systematic Literature Review (SLR) we executed. Besides the importance of the method used, since the approach to analysis and understanding of software project actuality was also based on the SLR results and findings, this chapter presents and discusses these findings.

4.1 SLR Objective

The SLR's main objective was to identify how project actuality had been researched and which methods, techniques or approaches are been used to observe and analyze project actuality. Besides, this research also aimed on identifying the theory associated with project actuality phenomenon, as well as to analyze how academics and organizations are analyzing it (SAMPAIO; MARINHO; MOURA, 2014b). It was our concern which methods and techniques are being used and carried on in which size of organizations and through which kind of studies.

4.2 SLR Strategy

SLR is a defined way of identifying, assessing, and analyzing published primary studies in order to investigate a specific research question (KITCHENHAM, 2004; STAPLES; NIAZI, 2008). A SLR is a way to evaluate and interpret all the available research, concerning to a particular research question, thematic area or phenomenon of interest (KITCHENHAM, 2007).

Part of evidence based practices paradigm, which evaluates the evidences in a systematic and transparent way. In a SLR, the research strategy and the evaluation criteria are explicit, and all the relevant evidences are included in the evaluation (KITCHENHAM, 2007). It follows a formal protocol to conduct research on a particular topic, with a well-defined sequence of methodological steps (MAFRA; TRAVASSOS, 2006).

Actuality research argues that while a great deal is written about traditional project management, we know very little about the reality of project based on working and management itself (CICMIL et al., 2006). Project actuality was one of the themes discussed in a research network (Rethinking Project Management), where the main argument was to enrich and to extend the subject of project management beyond its current conceptual foundations (WINTER et al., 2006).

In order to investigate and understand the "actuality" of project, it is necessary to analyze how researchers are observing and analyzing the actuality of software project and its management. This study is part of a PhD research on designing an approach to analyze and understand project actuality. Therefore, it is necessary to identify the methods used for analyzing project actuality, and better understanding this phenomenon. The systematic review method would be usable for this purpose and its results are presented here.

Three researchers where involved but the third ended up helping only as triggered punctually, just in case of disagreements, as a moderator. This section describes the course of each step in the methodology used to carry out this systematic review. The application of a systematic review requires a well-defined and sequential set of steps according to an appropriately designed study protocol. We followed Kitchenham's methodological guideline (KITCHENHAM, 2004) for systematic reviews. The following subsections describe details on the course of these steps.

We briefly present below the results of the identification, analysis, and synthesis of project actuality definitions, along with what and how academics and organizations are analyzing it.

4.2.1 Environment

Before conducting the searches, a directory in the cloud was created with access to all researchers. A free web store service was used by all researchers to store all articles identified, as well as data-sheets, partial reports and others. This enabled a full control of artifacts by the researchers, enabling each researcher to access the artifacts as if in a local environment, even though they were remote. We also developed some data-sheets to be used in all phases. The data-sheets facilitated the organization and the standardization of data in many aspects, such as publications searched, study, size, filters to extract objective information, and more. As we had only two active researchers, both had to work as readers, analyzers and synthesizers. We used CIn-UFPE labs to conduct all searches.

4.2.2 Search Strategy

The strategy for a systematic review is a search plan to identify and regain the smallest publication's set that meet the systematic review criteria. The criteria are conditions to define if primary studies address the research questions defined for the systematic review (KITCHEN-

HAM, 2004). The search strategy results in a protocol, which defines the research goal and procedures that includes the list of database engines and its research strings, research questions, selection criteria and steps to be conducted along the review, extraction procedures among others.

Search data engines were used to ensure unique results through the search for the same set of keywords. Our selection criteria were papers that contained an explicit statement about project actuality. For this research we selected only publications written in English. This choice was made because it is the language used by most international conferences and journals related to project management and by most publishers related to the topic listed in the CAPES Journals Portal.

Before engaging in the real search, an initial study was conducted for all phases, denominated "pilot study". The pilots were performed to align phase to phase the understanding among researchers and to test all search engines. The study only proceeded after all researchers were in agreement with its results. This review covered the period from 1994 to 2013, in four research database engines: ACM Digital Library, IEEEXplore, Science Direct and Springer Link. The idea was to cover the last twenty years of research. The engines were divided among the researchers. The results of each search were manually imported. Some engines had an export selection option, others did not. Anyway, all the results were combined in a single document per engine. The document had the author, title, year, abstract and keywords. The duplicity was also manually removed by "title".

In the automated selection phase, the searches were conducted in four sources, as previously mentioned. The Figure 4.1 shows the results obtained on each stage at systematic review process. At the synthesis phase, we have the number of quotes associated with each research question.

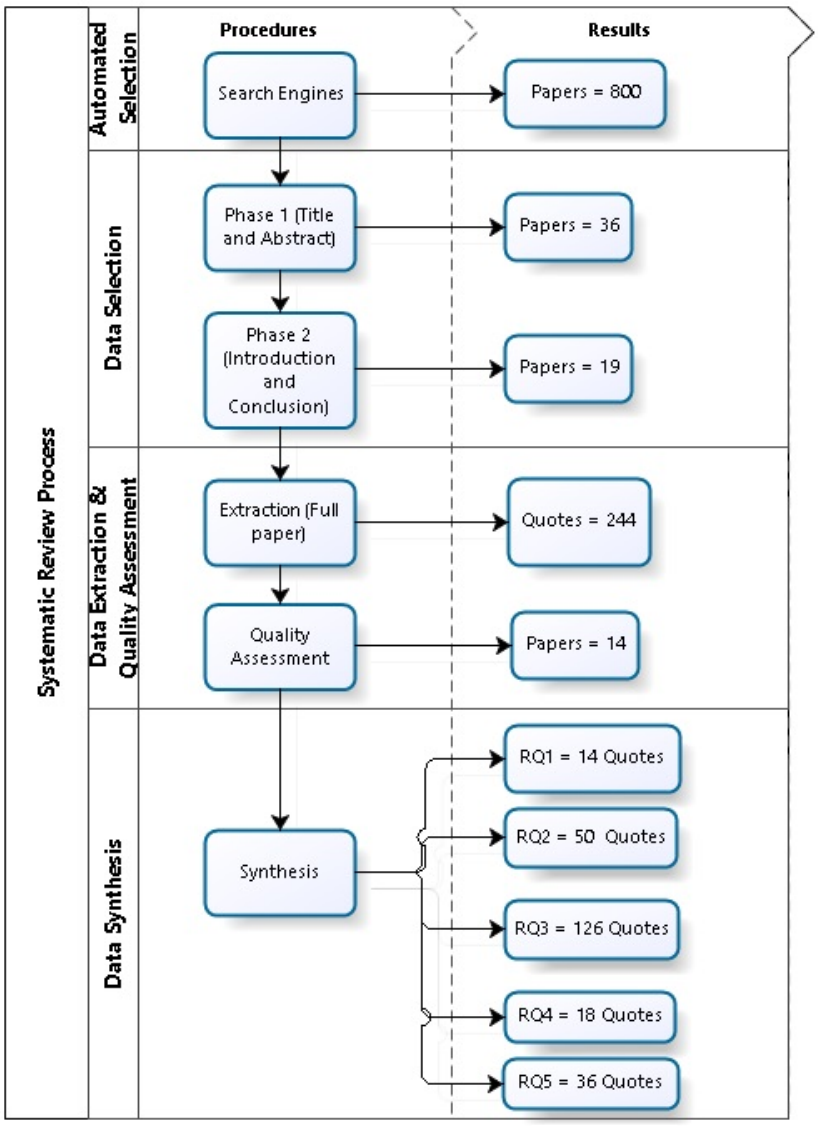


Figure 4.1: Results obtained on each phase of the systematic review process. Source: own elaboration.

4.3 The Search

According to Kitchenham (KITCHENHAM, 2004) the aim of a systematic review is to find as many primary studies relating to the research question as possible, using an unbiased search strategy. The search terms used in this study were developed using the following steps (KITCHENHAM, 2004, 2007):

1. Derive major search terms from the research questions by identifying Population, Intervention, Outcome, and Context.

2. Identify keywords and terms in the relevant papers.

3. Use Boolean OR to construct search strings from the search terms with similar meanings.

4. Use Boolean AND to concatenate the search terms and restrict the research.

   The resulting search string was "project actuality" OR "actuality of project" or (actuality and "software project").

4.3.1 The Selection

The idealized selection process has three steps: the automatic selection (the search); selection stage one, that covers the analysis of the title and abstract; and selection stage two, that covers the introduction and conclusion.

4.3.2 Automated Selection

The automated selection consists in the use of the research string in the chosen engines. In this phase, each researcher was responsible to find results in some engine and catalogue it, following a designed template for it, where 800 papers were retrieved.

4.3.3 Selection Stage 1: Title and Abstract

This phase consists in the selection of publications from the automatic search result set that could plausibly satisfy the selection criteria, based on reading 800 publications' title and abstract. Each researcher read the title and abstract of all 800 papers independently, and selected or excluded the publication. Keywords were also analyzed in this phase. Jointly, researchers discussed their results.

Most of the papers, from the 800, mentioned actuality as a "time period", or as an expression, that means "nowadays" or "these days". The expression was never as keywords, and most of the times that it occurred in the abstract, it meant something else. In this phase, if any disagreement, or doubt came in to sight, the paper was included. This selection stage resulted in 36 publications that attend the criteria.

4.3.4 Selection Stage 2: Introduction and Conclusion

The final selection stage consisted in reading the introduction and conclusion of each paper that satisfied the selection criteria during selection stage 1. Once again, both researchers did all the reading independently, to reduce potential bias. No disagreement was found in this phase. Then, 19 publications were selected to be read during the extraction data phase.

4.3.5 Study Quality Assessment

The Quality Assessment occurred along the Data Extraction phase. Both researchers read a full paper for the quotes extraction, at the same time they did the methodological quality assessment of each publication. According to KITCHENHAM (2007), the quality criteria purpose is to indicate which are the most relevant papers for the research. All selected primary papers were evaluated based on a quality criteria.

This evaluation was divided in two moments: in the first moment we aimed at quantifying the work relevance, based on the degree of compliance with the research questions. The following criteria was analyzed:

- (CRQ1) Does the paper present any definition on project actuality?
- (CRQ2) Does the paper describe or point to what can be observed about project actuality?
- (CRQ3) Does the paper depict techniques or approaches to observe and/or analyze project actuality?
- (CRQ4) Does the paper present any tip, insight, techniques or approach to enrich or enhance project management theory by understanding project actuality?
- (CRQ5) Does the work revel or give any tips on how, by understanding project actuality, can we enrich the knowledge created in the research process in project environments?

Along the selection, the studies were only suitable for inclusion in our review if they had evidences that helped answering at least one of the research questions, even if only partially collaborates to it. So if any aforementioned criteria were attended, the work was suitable for continuing in the Data extraction phase. For the compliance with the research question, the publication got a (2) for attending more then one question-criteria, (1) if it answers at least one question, and (0,5) if it partially answered a question-criteria.

In the second moment, the quality criteria intend to assess the work quality related to its structure, methodology, objectives and results. Only articles written in English were included. Along the preliminary search, we excluded technical reports or contents, which did not go through an external review, such as: books, technical reports, presentations among others. Both researchers performed the quality assessment. For each paper that was analyzed, if the publication mention its conclusion (2), if it mentions as in conclusion (1), or as an ongoing investigation (0,5). Two other factors were assessed as follows, and were each marked YES or NO.

- Does the publication mention the possibility of selection, publication, or experimenter bias?

- Does the publication mention possible threats to internal or external validity?

For this last two criteria, the quality assessment was based only on whether the publication explicitly mentioned these issues. We did not make judgments about whether the publication had a "good" treatment of these issues. The results did not exclude any publication.

None of the studies mentions its full conclusion. Ten of them mentioned it in the conclusion and three entitled themselves as an ongoing investigation. The others did not mention anything about the status of conclusion.

Importantly, these quality criteria were not used as inclusion and exclusion criteria. They were only considered after the articles have been selected as a means to rank the items according to their relevance to our research. As a systematic review, the researchers intended to identify the maximum of evidence to help them to set up a consistent view about the phenomenon.

4.4 Data Extraction

This phase consisted in reading the entire publication and extracting quotes that answers one of the research questions. Before the beginning of this phase, we performed a new pilot to calibrate this conception. The researchers selected one random paper among the 19 publications selected. The entire paper was read and the extraction was conducted in parallel and the information were structured according to the data model and data-sheet model created in the strategy plan, as the researchers discussed the results. Adjustments were necessary in the data-sheet, and our final data model is shown in Figure 4.2.

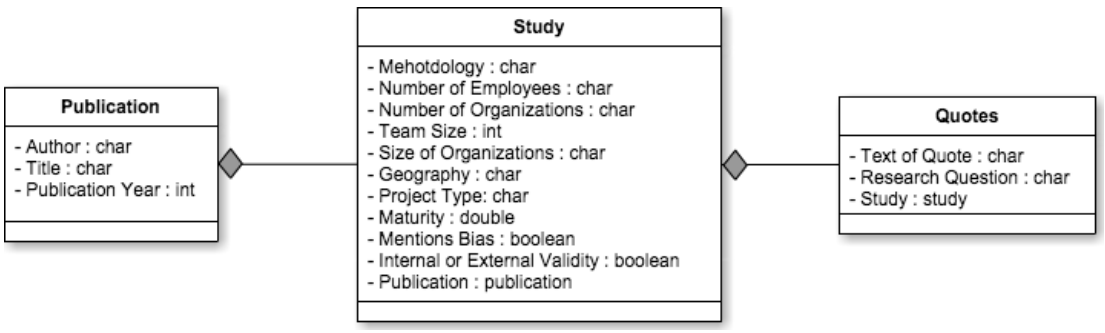


Figure 4.2: Research Data Model. Source: own elaboration.

A Publication is a technical report, conference article or journal article. From the 19 selected publications, the researchers identified six that did not showed relevant possible quotes to be extracted, resulting in 13 publications. Besides all the presented criteria, the most cited publications in the references were considered relevant, despite not having been identified by the automatic search. One new publication got into this selection and it was not indexed from the chosen engines, but it was cited by most of the publications selected. Which resulted in 14 final publications. Table 4.1 gives the end list of selected studies, by year. Excluding only the last publication included.

Table 4.1: End list of publications per year.

#ID	Year	Authors
s3 (SEGAL, 2005)	2005	J. Segal
s6 (CICMIL et al., 2006)	2006	S. Cicmil, T. Williams, J. Thomas, D. Hodgson
s10 (WINTER et al., 2006)	2006	M. Winter, C. Smith, P. Morris, S. Cicmil
s12 (CICMIL, 2006)	2006	S. Cicmil
s14 (CRAWFORD et al., 2006)	2006	L. Crawford , P. Morris, J. Thomas, M. Winter
s13 (HODGSON; CICMIL, 2007)	2007	D. Hodgson and Svetlana Cicmil
s1 (AVRAM et al., 2008)	2008	G. Avram, L. J. Bannon, A. Sheehan, A. Sigfridsson, D. K. Sullivan
s7 (SAUER; REICH, 2009)	2008	C. Sauer, Blaize Horner Reich
s8 (MAANINEN-OLSSON; MÜLLERN, 2009)	2009	E. Maaninen-Olsson, T. Mullern
s4 (SAGE; DAINTY; BROOKES, 2010)	2010	D. Sage, A. Dainty, N. Brookes
s5 (LALONDE; BOURGAULT; FINDELI, 2012)	2010	P. Lalonde, M. Bourgault , A. Findeli
s9 (WILLIAMS et al., 2010)	2010	T. Williams ,O. J. Klakegg , O. M. Magnussen , H. Glasspool
s2 (ADOLPH; HALL; KRUCHTEN, 2011)	2011	S. Adolph, W. Hall, P. Kruchten
s11 (POLLACK; COSTELLO; SANKARAN, 2013)	2013	J. Pollack , K. Costello, S. Sankaran

A Study in a publication describes an empirical investigation about organizations or researchers that have analyzed project actuality or knowledge creation on software project actuality. Four publications did not mention the investigation method, but it was considered as a study for its relevance on developing a better understanding project actuality or ways to observe and analyze it. For each study, we extracted information about the attributes defined in data-sheet.

Among the methods on the studies, the most common was Case Studies. There were 6 of them on a single organization and one with 3 organizations, followed by 4 Ethnographic Studies of one organization and others such as Actor Network Theory (ANT), Grounded Theory, Pragmatic inquiry and Questionnaire. From each study, we extracted a list of quotes. A Quote is a piece of text from the publication presenting the evidence that answers one of the following research questions:

- (RQ1) What is project actuality?
- (RQ2) What can be observed about project actuality?

- (RQ3) How can we observe and analyze project actuality?
- (RQ4) How current theories, concepts and methodologies underpinning project management research could be enriched by understanding project actuality?
- (RQ5) By understanding project actuality, can we enrich the knowledge created in the research process in project environments?

The main objective of this systematic review was to answer the first three questions. Anyways, two extra questions were pointed out to maximize the analysis on project actuality phenomenon. The two researchers worked separately in all the publications and by the end of the extraction phase, they agreed to an end set of 244 quotes extracted from 14 articles. Moreover, which question was answered by each quote. As mentioned before, six publications did not present relevant quotes and they were excluded after this phase.

4.4.1 Data Synthesis

At the end of the Data Extraction phase, we had extracted 244 quotes, each containing answers for one of the five research questions. Once again, both researchers worked in the synthesis that consisted in three steps:

- Generate combinations of quotes and research questions;
- Independently reviewed each quote-question;
- Discussing the findings;
- In order to facilitate the analyzes, the two researchers also agreed on grouping the quotes by similarities, such as techniques in RQ3.

There was a good level of agreement. Differences in opinions were discussed in a meeting and they were easily resolved without the need of involving a third researcher arbitrating, as planned. Some publications had quotes that answered more than one research question, as exhibited in Table 4.2. Research question 3 was the one with the most number of publications associated. It was also the question by far with most answers, with 126 quotes associated, as presented in Table 4.3. However, the first question, related to the phenomenon, the definition of project actuality as found in only fourteen quotes of six studies, as shown in Table 4.2 and 4.3.

4.5 Questions Analysis and Findings

This section discusses our systematic review, presents the results and helps on answering our research questions, as well as summarizes and discusses our findings.

Table 4.2: Research Questions X Publications.

Research Question	**Amount of Publications**
Does the paper present any definition on project actuality?	6
Does the paper describe or point to what can be observed about project actuality?	10
Does the paper depict techniques or approaches to observe and/or analyze project actuality?	14
Does the paper present any tip, insight, techniques or approach to enrich or enhance project management theory by understanding project actuality?	7
Does the work revel or give any tips on how, by understanding project actuality, can we enrich the knowledge created in the research process in project environments?	8

Table 4.3: Research Questions X Amount of Quotes.

Research Question	**Amount of Quotes**
Does the paper present any definition on project actuality?	14
Does the paper describe or point to what can be observed about project actuality?	50
Does the paper depict techniques or approaches to observe and/or analyze project actuality?	126
Does the paper present any tip, insight, techniques or approach to enrich or enhance project management theory by understanding project actuality?	18
Does the work revel or give any tips on how, by understanding project actuality, can we enrich the knowledge created in the research process in project environments?	36

4.5.1 General

One interesting finding was that most of the studies on project actuality were from Northern Europe as shown in Figure 4.3. There was one article from Canada (s2), one from Australia (s11), one that presented a multinational study that also included United Kingdom besides Canada, United States and New Zealand (s7) and all the others came from Northern Europe. In fact, that is the region where the expression "project actuality" was first presented, in the RPM (CICMIL et al., 2006; WINTER et al., 2006).

Another finding was that most of the studies were in medium to large organizations. One study mentioned 15 people in a team (considered medium), another "medium to large", all the other did not mention or mentioned "large organization" (7 studies). Even the ones that did not mention it became easy to exclude micro or small organizations, by the cited characteristics. In addition, one third of the studies were conducted in public-sector.

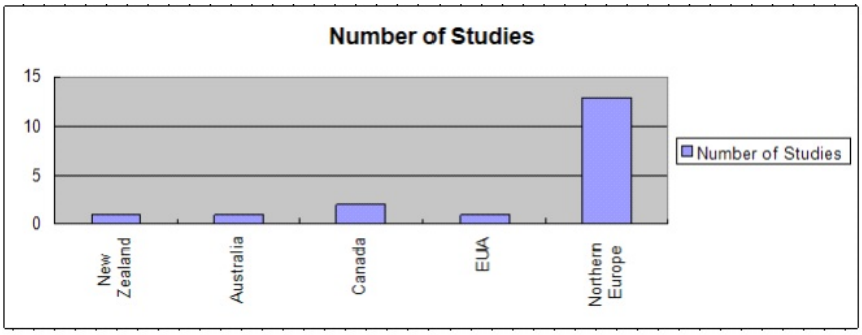


Figure 4.3: Number of studies per region-country.

4.5.2 Question 1: What is project actuality?

Only six publications defined project actuality. Study 6 from (CICMIL et al., 2006) is the most cited publication and most used definition. The majority of actors just adapted the definition presented by the authors or complemented it for a better understanding. For those who defined it, all of them have the same understanding that actuality is a lived experience. It focus on social process and how practitioners think in action, which goes beyond the project itself, to encompass its relationships with other individuals, groups, organizations and concurrent projects.

Even though this question was more informative, it helped for a better understanding the phenomenon researched. And also helped build our own definition of project actuality. Among the quotes we highlight the followings:

- In **s1**, AVRAM et al. (2008), states that:

  > "Our focus on software engineering as a collaborative human activity acts as an umbrella for a number of research interests centered on the concepts of communities, distributed teams, learning and networking (...) By putting into light the hidden aspects of these practices, we attempt to show what people actually do to get their work done in contrast with the prescribed processes."

- In **s6**, for CICMIL et al. (2006) project actuality encompasses the understanding of the lived experience of organizational members with work and life in their local project environments. "Their actions, decisions and behaviors are understood as being embedded in and continuously re-shaped by local patterns of power relations and communicative inter-subjective interaction in real time."

- In **s8**, MAANINEN-OLSSON; MÜLLERN (2009) affirm that project actuality encompasses "Paying attention to the context means going beyond the project itself,

to encompass its relationships with other individuals, groups, organizations and concurrent projects. "

- In **s9**, WILLIAMS et al. (2010) affirms that: "It looks not only at the circumstances of the project, but also at praxis, at context-dependent judgment, bounded rationality, power and politics, etc."

4.5.3 Question 2: What can be observed about project actuality?

By understanding the first question, the second got easier to answer. We concluded what is project context, relations and situations. Out of the ten publications that answered this question, Table 4.4 presents the most common aspect to be observed when dealing with project actuality.

Table 4.4: Most common *what*

Technique/Strategy	Publications
Social process or social relations	s2, s5, s6, s7, s8, s12
Context	s2, s5, s6, s8, s13
Situation	s2, s5, s6, s12, s14
Human action	s6, s7, s13, s14
Relation	s5, s6, s8

The studies presented that to understand project actuality it is necessary to observe the social process, the context, actors' possibilities and options when confronted with a particular situation (LALONDE; BOURGAULT; FINDELI, 2012). And also "situating projects in existing and emerging social relations" (MAANINEN-OLSSON; MÜLLERN, 2009), unusual things and activities rather than "universal" elements of perceived "good practice" (CICMIL, 2006).

Still on what we have to observe, the following constructs arose: actors, meetings, central concern and critical movement. In addition to a way to engage with projects, "what the actors do and how they do it", concepts of judgment, intention, motivation, purpose, value, reason for acting, problematic situations, speech, statement and related.

4.5.4 Question 3: How can we observe and analyze project actuality?

For the third question, we grouped techniques to help answering the question. The quotes presented different tips, methods and techniques or strategies to analyze project actuality, such as observation, ethnographic methods, interview, building trust, documentation analysis, meetings follow up, to present the results to the interviewees, among others. Table 4.5 presents the most common techniques or strategies identified to observe and analyze project actuality.

Besides the techniques, several tips and strategy were recidivist in the studies such as: observe meetings (4 quotes), attention on how to register and what to do with the data (9 quotes),

Table 4.5: Most common techniques or strategies.

Technique/Strategy	Publications
Interview	s1, s2, s3, s5, s6, s7, s8, s9, s12
Observation	s1, s2, s5, s8, s12, s13
Documentation Analysis	s1, s2, s3, s5, s8, s9
Meeting follow up	s1, s3, s5, s8

record Interviews (3 quotes), present the results to the interviewees (2 quotes), build trust (4 quotes), among others that just appear in one study.

Among the many quotes that helped answering how to observe analyze the phenomenon, we highlight the followings:

- (s1) "We participated in a number of team meetings, studied the documents in the project repository and interviewed the team manager and a few developers, in order to familiarize ourselves with the context and the work being done" (AVRAM et al., 2008).

- (s2) "A further challenge for engineers who are more comfortable with an objective view of reality is that when studying people, we cannot ignore our personal values because personal values influence the ways people interpret reality(...) observe what people did, it is an important mainstream data collection method rather than a mere supplement to interviews" (ADOLPH; HALL; KRUCHTEN, 2008).

- (s6) "In this kind of work the attention is refocused on praxis, on context-dependent judgment, on situational ethics and on reflexivity which enables social actors to see how power actually functions in context" (CICMIL et al., 2006).

- (s8) "Repeated interviews with respondents were thus a crucial element, serving to validate themes as they emerged. Formal interviews were accompanied by informal discussions, observations and documentary studies in different points of time, in order to ensure a fundamental familiarity with the context of the project" (MAANINEN-OLSSON; MÜLLERN, 2009).

4.5.5 Question 4: How current theories, concepts and methodologies underpinning project management research could be enriched by understanding project actuality?

The studies present a flat understanding that by publishing the findings of project actuality, we can generate a complementary set of knowledge that will help practitioners in project management practice. By understanding what really happens in project actuality, and better understanding of what literature to suggest or engage. Still, CICMIL et al. (2006) has the

publication with the most representative quotes for the concept. The following topics present the most representative quotes on "How to enrich project management theory?":

- (s4) The development of new forms of project management practice, training and education that are better able to apprehend social complexity, power relations and tacit knowledge and self-reflexive practice describe various acts that guide the inquiry process in project conduct and explore the bidirectional nature of the interactions (SAGE; DAINTY; BROOKES, 2010).

- (s6) Focused on serious consideration of "knowledge in action", actuality research provides an insight into some shortcomings of the mainstream goal of disseminating "best practice" in project management (CICMIL et al., 2006).

- (s6) Such a combination of theoretical and methodological approaches enabled researchers and participating practitioners to address together the important issues of project management praxis such as social responsibility, judgment, emotions, the operation of dominant discourses, power-knowledge relationship, and practical wisdom, which are rarely captured by conventional research methodologies in project management (CICMIL et al., 2006).

4.5.6 Question 5: How by understanding project actuality can we enrich the knowledge created in the research process in project environments?

Even though some may think this question is out of context, those who study project actuality understand the relation. This is definitely a challenge, but doable. The main idea is to help the knowledge creation process, where reflectivity is crucial and it counts on a self-reflexive practitioner. One ready to engage in reflective activities. The quote from the study s14 represents it the most. The following ways to enrich knowledge in project environment and its study are listed bellow:

- (s4) Turn to reflexivity as a synthesis or reconciliation of control/creativity (SAGE; DAINTY; BROOKES, 2010).

- (s5) Describing various acts that guide the inquiry process in project conduct and explore the bidirectional nature of the interactions: descriptive practices support project-defining proposals, and design practices, expressed through discourse, convey the actors' intentions (LALONDE; BOURGAULT; FINDELI, 2012).

- (s5) We emphasize that this type of theorization can serve as a "tool of thought", a "cognitive tool" to nurture project management is practice by systematically adopting

a reflective and critical stance toward the inquiry trends (LALONDE; BOURGAULT; FINDELI, 2012).

- (s6) Actuality research provides an insight into some shortcomings of the mainstream goal of disseminating "best practice" (CICMIL et al., 2006).

- (s12) By interpreting the empirical material gathered in the process of prolonged active interviewing and collaborative participative interpretation of accounts reflecting experiences of project practitioners, we can generate alternative understandings of what goes on in project practice (CICMIL, 2006).

- (s14) Less separation between learning and actual practice, accompanied by less focus on knowledge acquisition and more emphasis on holistic capability development that extends beyond knowledge to encompass practical application and experience, attributes and behaviors (CRAWFORD et al., 2006).

4.6 Closing Remarks

This chapter presented the results of a systematic review on software project actuality. A total of 800 papers were returned, of which 19 were selected after the second stage of the selection. Later on, 6 publications were discarded due to not answering any of the research questions. As a result, 13 studies were selected. During the extraction phase, 1 extra publication was added, coming from an analysis of the 19 original selections citations that came from a different search engine not included in our research protocol. Data were extracted from all 14 studies. They were analyzed and then synthesized against the defined research questions. Table 4.6 depicts the main contribution of each study on our research, focusing on the questions and motivations that guided the SLR.

Table 4.6: Most common techniques or strategies.

Motivation	**Publications**
Helping understanding and establishing the definition of project actuality	s1, s5, s6, s8, s9, s10
What to look for to understand project actuality	s2, s4, s5, s6, s7, s8, s10, s12, s13, s14
Methods, techniques to observe project actuality	All studies, from them s1, s5 and s8 had the biggest contribution to the approach
How to enhance project management theory based on project actuality and also inspiration for the reflection and intervention activities on the approach.	s1, s2, s4, s5, s6, s12, s14
How to enrich knowledge in project environment based on its project actuality. It also inspired the reflection activity on the approach.	s1, s4, s5, s6, s7, s12, s13, s14

Our results showed that project actuality is not a solid phenomenon and not many studies were carried long after the RPM (WINTER et al., 2006). Cicmil is the most collaborative author in this subject. The concept is most known and analyzed in Northern Europe, by the public sector, engineering projects for medium to large organizations. For those who defined it, all have the same understanding that actuality is a lived experience, focusing on social process and how practitioners think in action. That goes beyond the project itself, to encompass its relationships with other individuals, groups, organizations and concurrent projects.

Furthermore, many methodologies were used to analyze it such as ANT, Case studies, Ethnography, Grounded Theory, Pragmatic inquiry, Questionnaire, observations and interviews. Independent of the method, interviews, observations, documentation analysis were the most flat technique used to observe and analyze project actuality.

The systematic review helped obtain a better understanding of the definition of project actuality and identified best ways to observe and analyze it. Techniques and strategies found in this study were used to build the approach and to carry software project observations in small organizations in Brazil.

Moreover, the SLR process strengthened the bond between the participating researchers, an important step for the evolution of this work.

5

The Approach

The most beautiful thing we can experience is the mysterious. It is the source of all true art and science.

- Albert Einstein

This chapter presents this thesis main result, the approach idealized to observe and understand project actuality. As previously presented, based on the systematic literature review on project actuality (SAMPAIO; MARINHO; MOURA, 2014b), an approach to research, observe, analyze and understand project actuality was created. The review intended to answer questions such as "What can be observed about project actuality?", "How can we observe and analyze project actuality?", and "By understanding project actuality can we enrich the knowledge created in the research process in project environments?". Based on the findings of those answers and with the help of the exploratory review the approach was built.

The formal description of the approach was inspired by ISO 12207 (ISO, 1998), the international standard and reference model for the Software Life Cycle Processes, that aims to provide a single structure for the purchaser, vendor, developer, maintainer, operator, managers and technicians involved with the software development using a common language that is established in the form of well defined processes. Each activity presents its goal, income artifacts, exit criteria, steps to be executed, its outcomes, and performers. It is also presented some comments for each activity, observations and adaptation tips for organizational internal researcher.

Any researcher or practitioner can use and apply the approach in order to research into their project actuality. The role responsible for executing the approach is almost always referenced as researcher, although any team member, leader or practitioner of any kind can turn into a researcher in order to understand its actuality. The steps are detailed in order to be simple and easy to understand. The researcher abilities to observe, listen without judgement or preconceptions are necessary in order to see real problems and possibilities within the project actuality. In order to conduct the reflections the moderator should be able to motivate the team and maintain the meeting focus.

Figure 5.1 presents the approach that will be detailed along this chapter. The approach

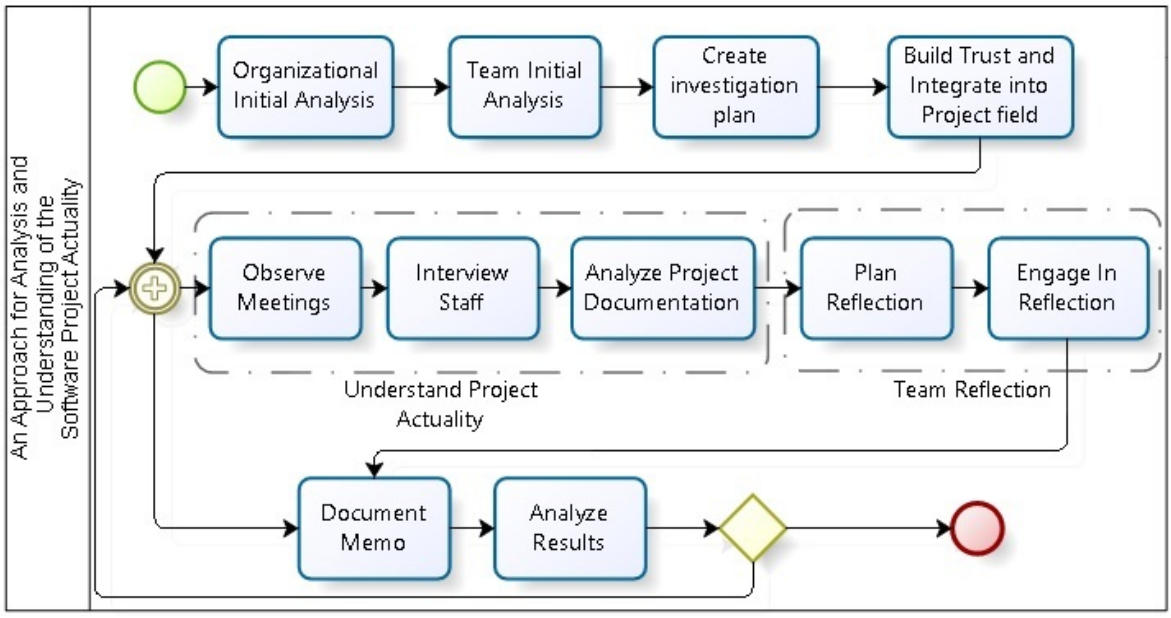


Figure 5.1: Research Approach . Source: own elaboration.

was modeled with BIZAGI[1], a free tool for business process modeling. The entire description of the approach, as a process, is in Appendix C.

5.1 Organizational Initial Analysis

COMMENTS: The main idea was to prior analyzing project's context, to begin the understanding of the organizational culture and its context. That means to understand and analyze which are their clients and its profile, products, technologies, goals, areas of interest, organization chart, process, infra-structure, dynamics, workplaces, and others. To start this step, it was necessary to have organization's understanding of the research goal and the wiliness to engage in the research activity, for that in every case we started scheduling a conversation with organization's high level management. Besides, the invitation letter, introduced in Appendix A, must be presented and signed by both parties, as explained in Chapter 3.

In this activity the idea is to reinforce the non-disclosure agreement and inform the beginning of the work. It took at least two visits of 3,5 to 6 hours in each study, focusing exclusively on the organization in general, in order to meet this first step main goal.

Goal

- Analyze organization, its clients, goals, areas of interest, organization chart, products and process.

Start Criteria

[1]http://www.bizagi.com/

- Organization's understanding of the research goal and the wiliness to engage in the research activity.

Income

- Contact with organization's leader or project manager;
- Invitation letter prepared (Appendix A) or signed.

Exit Criteria

- Organization's preliminary understanding created.

Steps

- Schedule a conversation with organization's high level management;
- Establish or reinforce a non-disclosure agreement;
    - If the invitation letter is not yet signed, both parties must sign it in this moment.
    - The reinforcement is necessary if this step was previously accomplished.
    - This step will allow the organization to feel less uncomfortable with sharing information, documents and opening their door to the research.
- Meet with them and elicit organizations goals, products, perceived problems and interests;
- Understand their clients profile;
- Draft organization's profile in order to help in the research plan elaboration;
- Ask for organization chart, roles description, formal and informal organization;
- Ask for permission to observe and talk to their staff. At least the leaders must be involved in a quick conversation;
- Collect data such as:
    - What are the Teams, their objectives and their relevance to the organization?
    - What problems concerns their project or themselves?
    - What are the conflicts they deal with nowadays?
- Investigate and stimulate talking;

- Do installations recognition and document it.

Outcomes

- Organization's preliminary understanding;
- Roles and contacts from project and team members;
- Minutes in case of meetings;
- Non-disclosure agreement.

Observation

- This cycle of understanding might take more than one visit. The importance is to gather enough information to elaborate the investigation plan.

Adaptation tips

- If the researcher is going to be someone from inside the organization, this step may be suppressed. Although we strongly recommend to analyze the opportunities of a fresh and new look on its own organization.

Performers

- Researcher.

5.2 Team Initial Analysis

COMMENTS: This activity focuses on narrowing the initial analysis to the team(s) that will be the focus of the inquiry process, in order to understand their context, agenda and dynamics.

Goal

- Analyze team(s), how the communication flows, what is their agenda, their roles, motivations and leaders.

Income

- Organization's preliminary understanding;
- Roles and contacts from project and team members;
- Minutes in case of meetings;
- Non-disclosure agreement.

Exit Criteria

- Teams' preliminary understanding created.

Steps

- Analyze team's process and understand it;
- Collect information about team's agenda;
- Start the team's context understanding;
- Collect the following data:
    - Name, Team role, Team name, time in the organization.
    - What is their identification and profile?
    - What are their activities? When does it begin?
    - What are the conflicts they deal with nowadays?
        - What do they do when they come?
- Collect team's formal and informal agenda;
- Investigate and stimulate talking.

Outcomes

- Organization's preliminary understanding and teams' preliminary findings;
- Minutes in case of meetings.

Observation

- This cycle of understanding might take more than one visit. The importance is to gather enough information to choose relevant teams and to refine investigation plan.

Adaptation tips

- If there is just one team, then this step can be combined with organizational initial analysis.

Performers

- Researcher.

5.3 Create Investigation Plan

COMMENTS: Based on the organizational and team analysis, an investigation plan must be established. Appendix B presents a template in Portuguese to this plan.

Goal

- Create and establish an investigation plan, contemplating teams (or areas) formal and informal agenda.

Income

- Organization's preliminary understanding and teams' preliminary findings;
- Roles and contact inside projects;
- Non-disclosure agreement;
- Minutes in case of meetings.

Exit Criteria

- Plan created and approved by organization's sponsor.

Steps

- Define the sample: what teams/project will be observed;
- Narrow the research objective or scope;
- For each project or area to be analyze, identify team, routines, times and schedules. The goal is to have more than one project in the sample, to be observed through its entire life cycle;
- Document teams agenda as weekly research schedule (every meeting is an appointment for observation);
- Plan visits to contemplate observing teams agenda as weekly research schedule;
- Every field event must be considered formal and informal;
    - That means to plan the research agenda according to team's agenda, contemplating formal and informal communication moments.
- Establish the plan. The plan template can be seen in Portuguese in the Appendix B;
- Get sponsor's agreement on the plan.

- As researcher, and in order to analyze team's actuality and project actuality, you must let people know you are going to be around. Formal or informal agreement on the plan is very useful.

Outcomes

- Investigation plan approved.

Adaptation tips

- The plan is important to narrow the research objective. This step is mandatory regardless if the person is an outsider research or an internal one.

Performers

- Researcher

5.4 Build Trust and Integrate into Project field

COMMENTS: This integration is to avoid being seen as an outsider that interfere in the team's dynamics, in a way that what we see won't be what really happens on the field. As results it is expected the research awareness all project and team dynamics, and to be able to blend as similar. In order to reach this goal it is necessary to engage in informal conversations.

Goal

- Integrate into the observation field (PATTON, 2005);
- Build trust and familiarity, which make it safe for people to approach researchers and participate in the study.

Income

- Investigation plan approved.

Exit Criteria

- Researcher aware of project and team dynamics;
- No different treatment to the researcher once he/she gets in;
- Researcher able to blend as similar (as much as possible);
  - If you can not tell the difference if you are trusted or not, at least make sure people are not treating you different from anybody else.

Steps

- Ask project manager or project leader or scrum master to briefly explain what you are doing in the meetings and at the organization. Or informally, explain what is the goal of the study for team members, if the opportunity comes;
- Show the intention, make it clear that all the findings will not have any attribution;
- Arrive long before the scheduled time (LALONDE; BOURGAULT; FINDELI, 2012);
- Maintain a regular visitation schedule at field sites. Even if you are not able to or not planning to collect data during those moments;
    - By simply being on site, even if not explicitly engaged in data collection, helps to build trust and familiarity, which makes it safe for people to approach us and participate in the study (ADOLPH; HALL; KRUCHTEN, 2011);
    - Regular visitation schedule develops trust, such that will encourage people to approach you and share their story.
- Engage in informal conversations.
    - Meet people;
    - Drink Coffee;
    - Have lunch with team members. Informal conversation are very useful to integrate in the field.
- Listen to them;
- Informally analyze conflicts, problems, singularities, and fortresses;
- Document findings. Always take notes, the quote spoken, the actor involved, the situation it came out and context it occurred;
- Invite them on engaging as researchers;
- Refine intervention plan.

Outcomes

- Familiarity with team and field;
- Project initial understanding and team trust gained;
- Research plan refined;

- The plan must be always refined to maintain coherency to project actuality. Although there is no predefined amount of hours. The idea is to get involved, to get to know people. This moment must be seen as a pilot for understanding project actuality.

- Researcher integrated with project field.

Observations

- Although the plan is very important, it is not useful at this moment. You are an outsider and until this premise does not change you will not be able to blend as similar;

- There is no pre-defined amount of hours for this activity. The idea is to get involved and gain trust. A procedural and systemic approach allows researchers to get adequate and trustworthy answers to their questions (MAANINEN-OLSSON; MÜLLERN, 2009);

- The question in this moment is not a matter of time, but a matter of been trusted or not. Once you get in, if everyone feels uncomfortable, probably are not acting like themselves.

Adaptation tips

- Even though the organization member is not an outsider, he/she must make sure that colleagues know about his/her intention and make sure he/she is not seen as a police officer or inspector.

Performers

- Researcher

5.5 Observe Meetings

COMMENTS: After gaining the trust, the real deal starts. Beside the daily routine, as mentioned before, everything must be observed, but meeting are unmissable moments. According to LALONDE; BOURGAULT; FINDELI (2012), we must attended a number of different project meetings. Since all the organizations are MSE, with small projects, or teams, the idea was to attend to all meeting and observe them, its conversations, conflicts, problem-solving, context, feelings, everything that was expressed by words. Although we focused and experiment the approach only on MSE, it maybe can also be applied to bigger organizations. For each organization, all meetings along the project were observed.

Goal

- Observe project context and begin to understand project actuality, by observing the meetings.
    - Observation enables you to see how people actually conduct their lives *versus* how they say they conduct their lives (ADOLPH; HALL; KRUCHTEN, 2011);
- Identify conflicts, problems, singularities and fortresses;
- Understand more clearly the context of the project and thereby get a more comprehensive view of the various challenges confronting the managing of projects in practice (MAANINEN-OLSSON; MÜLLERN, 2009).

Income

- Familiarity with team and field;
- Project initial understanding and team trust gained;
- Research plan refined;
- Researcher integrated with project field.

Exit Criteria

- Several meetings observation, conversations observations, problem-solving or discussed observation. Culture, motivation, context, causalities and actuality aspects identified. All meetings must be attended from at least one project. And until a problem backlog is identified with its causalities, new meetings must be observed.
- Communication and "power" map identified;
    - Identify how the communication flow works. It will help the overall analysis.
- Problem backlog, its evidences and associated causalities documented.

Steps

- Attended a number of different project meetings (LALONDE; BOURGAULT; FINDELI, 2012). If it is possible, attend to all meetings;
    - Observe project meetings, at customer meetings and at various functional meetings (MAANINEN-OLSSON; MÜLLERN, 2009);
    - Researches are interested in unusual things and activities rather than "universal" elements of perceived "good practice" (CICMIL, 2006).

- Look at participants in real workplaces (AVRAM et al., 2008);
- Participating overly or covertly in people's daily lives for an extended period of time, watching what happens, listening to what is said, gathering whatever data are available to throw light on the issues that are the emerging focus of inquiry (HAMMERSLEY; ATKINSON, 2007);
- Follow the project over time, and thereby to study the different spatial and temporal challenges as they occurred (MAANINEN-OLSSON; MÜLLERN, 2009);
- Be primarily concerned with "what is going on" and try to understand "why it happens" (MAANINEN-OLSSON; MÜLLERN, 2009);
- Investigate social and cultural patterns and meaning (SCHENSUL, 1999). Discover what really goes on in particular technical communities, and for revealing subtle but important aspects of work practices (EASTERBROOK et al., 2008);
- Study real work circumstances (AVRAM et al., 2008);
- Capture the discourse of actors who are working on projects and examine the ways in which these actors enter into, question and act on project situations (LALONDE; BOURGAULT; FINDELI, 2012);
- Study people and do not ignore personal values because personal values influence the ways people interpret reality (ADOLPH; HALL; KRUCHTEN, 2011);
- Observe informal discussions in order to ensure a fundamental familiarity with the context of the project (MAANINEN-OLSSON; MÜLLERN, 2009);
- Collect data using participant observation, which allowed us to observe what people did (ADOLPH; HALL; KRUCHTEN, 2011);
- Look very closely (GENZUK, 2003). Make sure that every theme is covered by various kinds of observations (MAANINEN-OLSSON; MÜLLERN, 2009);
- Elaborate a problem backlog with conflicts, problems, singularities and wastes. Each gap must be connected to its evidences and theory that supports it.

Observations

- The above steps must continue until the information saturates. That means much more of the same has been observed and nothing new is coming. In addition, until a problem backlog is identified with its causalities, all steps must continue.

Outcomes

- Notes, tapes, discourse, context, circumstance, situation, actions and problems documented;
- Project or team's analysis;
- Doubts or inconsistencies to elucidate in interviews;
- Problem Backlog.

Adaptation tips

- The observation for an organization employee must narrow the scope to be analyzed. Most of the steps are tips to be successful in this task. Try to give another look for the daily routine and conversations around you. This activity is mandatory.

Performers

- Researcher

5.6 Interview Staff

COMMENTS: This step consists in the collection of data using semi-structured interviews (ADOLPH; HALL; KRUCHTEN, 2011; SEGAL, 2005; SAUER; REICH, 2009; MAANINEN-OLSSON; MÜLLERN, 2009; WILLIAMS et al., 2010) and informal interviews. Besides all the observations, the research should involve all team, or all leaders on this step. Be aware of the team dynamics to avoid be inconvenient or have a poor interview. To enrich the findings, the researcher must identify recurrent patterns that cut through the different individual stories in the interviews.

Goal

- Identifying recurrent patterns that cut through the different individual stories in the interviews;
- Assess the knowledge. Respondents are seen as repositories of knowledge about their actuality (CICMIL, 2006).

Income

- Investigation plan;
- Specific doubts or inconsistency observed to be clarified;
- Previous Notes, tapes, memos, discourse, context, circumstance, situation, actions and problems documented;
- Problem Backlog.

Exit Criteria

- Data and knowledge extracted from interviews

Steps

- Collect data using semi-structured interviews (ADOLPH; HALL; KRUCHTEN, 2011; SEGAL, 2005; SAUER; REICH, 2009; MAANINEN-OLSSON; MÜLLERN, 2009; WILLIAMS et al., 2010);
    - One question that becomes quite important during the interview is asking "why?" (ADOLPH; HALL; KRUCHTEN, 2011). Examples: Why the conflict occurred? Why the situation was a problem? Why the decision was A not B? Why not...
    - Document contextual changes that were affecting them, ask how is it affecting their roles, the management practices (SAUER; REICH, 2009).
- If consented, record interview for future transcription (MAANINEN-OLSSON; MÜLLERN, 2009; AVRAM et al., 2008; ADOLPH; HALL; KRUCHTEN, 2011; CICMIL, 2006);
- Interviews must take place on actual project sites allowing the researchers to observe project managers in action (CICMIL, 2006);
- Repeated interviews with respondents, it serves to validate themes as they emerged (MAANINEN-OLSSON; MÜLLERN, 2009);
- Conduct informal interviews with the actors (LALONDE; BOURGAULT; FINDELI, 2012);
    - Informal interviews should be considered complimentary. Those interviews taken during lunch, coffee or breaks can be considered informal.
    - Interviewed the team manager, developers, department managers, project participants from the focal organization and consultants.
- Revise problem backlog with new problems, issues and its causalities.

Outcomes

- Notes, tapes, discourse, context, circumstance, situation, windows, recurrent patterns, actions, problems and causalities documented.

Adaptation tips

- All information must be crossed. Doubts must be elucidated and confirmed. Maybe, this must be the most difficult task, since colleagues cannot take it seriously. However, chose the right interviewees that will really enrich your research and project analysis.

Performers

- Researcher

5.7 Analyze Project Documentation

COMMENTS: In addition to all observations and interviews, the researcher should also analyze project documentation. As we are dealing with software development organizations, the analysis can contemplate data from many sources such as tools, project repository, dashboards and others. All documentation must be considered.

Goal

- Analyze project documentation.

Income

- Company and project documentation collected.

Exit Criteria

- Documentations analyzed.

Steps

- Study the documents in the project repository;
- Collect data from many sources;
- Make sure that every theme is covered by various kinds of written material;
- Cross analysis with data collected. Look for inconsistency or reinforcements for your findings;
- If you are analyzing projects metrics, results, client feedback, variation of budget, scope and schedule must be analyzed in order to guarantee that you have the right view.

Outcomes

- Project documentation analyzed.

Adaptation tips

- Even if you are familiar with the documentation, now is the time to analyze with an independent look.

Performers

- Researcher

5.8 Plan Reflection

COMMENTS: According to Crawford (CRAWFORD; POLLACK, 2007; CRAWFORD et al., 2006; CRAWFORD, 2006) reflexivity is often presented as the key strategy to overcome theory-practice gaps within project management. Based on the problem backlog built along the observations, interviews and documentation analysis and in the actuality observed (which fact endorses each problem), to chose the theory that can support the gap/problem, and the team's reflection.

Goal

- Select theory to support reflection and plan reflection based on the project actuality findings.

Income

- Previous Notes, tapes, memos, discourse, context, circumstance, situation, actions and problems documented;
- Project Actuality findings that came together up to this moment;
- Problem Backlog revised.

Exit Criteria

- Reflections planed.

Steps

- Analyze all the causalities in the problem backlog and suggest action strategies to be discussed;
- Use theories on project management, agile methods, maturity models to draw strategies and questions to be discussed. Other theories must be included, if the problem is related to other areas of interest;
- For each conflicts, problems or singularities establish questions to help and to stimulate reflections;
- Revise project actuality findings. Make sure you do not miss any real problems;
- Add any other challenge, pointed by others researchers to the problem backlog;
- Present and discuss problem backlog to a few leaders in order to establish a priority on the reflection;

- Plan the meeting. Make sure that everyone that can make a difference will attend to the research planning meeting. Invite specialist if he can help in a specific problem;
- The moderator must be studied the theory and the problems data in order to conduct reflection meetings;
    - The discussion usually takes time. Our experience suggests from 1,5 hours to 2 hours meeting.
- Book the meeting with project manager, scrum masters and organizational leaders. You do not want to lose the opportunity to get everyone you need involved.

Outcomes

- Problem backlog revised with questions to be carried during reflections;
- Theory studied;
- Moderator assigned;
- Reflections meetings booked.

Adaptation tips

- This second part of the approach (team reflection) is for those who wants to reflect about the findings. The best choice is to use organizational meeting to help the reflection. However, the reflections take time and you will probably need two hours. Plan wisely.

Performers

- Researcher

5.9 Engage In Reflection

COMMENTS: Every time an opportunity is identified, it is considered as a trigger to execute this step, although retrospectives or lessons learned meeting are well set for it as well. This step of the approach also make it possible the final step in the qualitative method planed by this work's methodological strategy, the action research. The interview must help team's rethinking and reflection. The entire idea of engaging in reflection is to help the team to use their knowledge, skills and change the attitude towards a *status quo*, based on a specific situation, project context or aspect. All the information raised up to this moment will help on bringing up problems, improvements opportunity to discussion. The researcher is no longer alone, every team member is a tool for achieving project enhancement, towards organization success.

Goal

- Conduct active interview or participant observation and to get those who are being researched to play an active role in the process, rather the being passive subjects (CICMIL, 2006);
- Help team to engage in reflection about the best way to overcome a problem, a conflict or an improvement opportunity;
- Support team reflections with associated theory.

Income

- Opportunity identified;
- Problem backlog revised with questions to be carried during reflections;
- Theory studied;
- Moderator assigned;
- Reflections meetings booked.

Exit Criteria

- Project Reflection and actions idealized.

Steps

- For every identified problem, conflict, singularities that was prioritized, ask how can they overcome such problem, or how could it be done in a different way;
- Evolve around questions (CICMIL, 2006), such as *How*, *When* and *Why*;
- Use a data collection method known as "active interviewing" (CICMIL et al., 2006; CICMIL, 2006);
- Use project management theory to endorse and support reflections;
- Consider project actors researchers in action, who must continuously question their actions and intentions in light of real-world situations (CRAWFORD, 2006);
- Stimulate reflection, invite them to challenge the *status quo*;
- Talk about the identified problem, conflict, singularities. Ask how can they overcome such problem, or how could it be done in a different way;
- Moderate the meeting, invite and provoke all participants to contribute and keep the focus of the meeting;

- Document findings. Always take notes, the quote spoken, the actor involved, the situation it came out and context it occurred.

Outcomes

- Data collected;
- Identified actions from project rethinking and reflection;
- Detailed records of the field work-interviews (CICMIL, 2006).

Adaptation tips

- This second part of the approach is for those who wants to reflect about the findings. Although it is optional, it is strongly recommended. It helps to decided what to do with the project analysis.

Performers

- Moderator

5.10 Document Memo

COMMENTS: An overwhelming amount of data is usually produced. The most difficult step in this research approach is to document or transcript all narratives, written or spoken. Everything seen and listened. One hour inside the organization turned into **at least** two and a half hours (1 hour observation + 1,5 hours "memoing"). If we had to deal with tapes, the time doubles.

Goal

- Take filed notes from interviews and observation (AVRAM et al., 2008; ADOLPH; HALL; KRUCHTEN, 2011; LALONDE; BOURGAULT; FINDELI, 2012; MAANINEN-OLSSON; MÜLLERN, 2009). Field notes include some discussion of context, which should be limited to that necessary for the reader to interpret the action.

Income

- Observations and Interviews field notes.

Exit Criteria

- Data and knowledge from interviews and observations documented.

Steps

- Keep diary and take detailed field notes on every day spent in the field. Descriptions on every scenario, motivation, cultural must be transformed in a generous description.

        - Filed notes include some discussion of context, which has been limited to that necessary for the reader to interpret the action.

    - Document the speech to establish that the contents accurately reflect "a reality that exists independently of any individual observer, interpreter or writer" (HODGSON; CICMIL, 2007);

    - Write memos (AVRAM et al., 2008; LALONDE; BOURGAULT; FINDELI, 2012). Throughout the process, the researcher writes memos, capturing his or her thoughts that supports the emerging concepts, categories and their relationships;

    - Organize them by date;

    - New data is constantly compared against previously observed data and concepts.

Outcomes

- Previous notes, tapes, discourse, context, circumstance, situation, actions and problems documented.

Observations

- This is a continuum activity. It is parallel to all the others. It does not mean that the data will only be documented at this moment;

- Memos may not contribute to the theory but they captured interesting insights that emerged from the data (ADOLPH; HALL; KRUCHTEN, 2011).

Adaptation tips

- In order to be able to analyze the data, this step is mandatory. Although new forms of documentation can be used.

Performers

- Researcher

5.11 Analyze Results

COMMENTS: Interpret and analyze field notes. All the observations, all the work up to this point must be analyzed. The main idea is to understand project actuality in the context of these small development organizations. We learn to do not wait more than a few days to analyze the data already documented. Data stacks up and since it is too many data to process, if we take more than a few days to process it and analyze it, sometimes we are not able to understand what we wrote, or what was said in a meeting.

Goal

- Analyze project or team's actuality based on field notes;
- Go beyond a description of particular occurrences to identify the patterns that occur (LALONDE; BOURGAULT; FINDELI, 2012).

Income

- Data field and memos analyzed.

Exit Criteria

- Field notes analyzed.

Steps

- Look for causalities on each problem, aspect and issue identified. Tools such as ATLAS.Ti can help with data organization and analysis. At least a document that list for each problems, its evidences of occurrences, possible causalities and commentaries must be kept.
- Revise data to include new meanings by coding the data. Include colors, codes anything that will help identify the causalities along the research;
- Explore meaning and actions in the data by looking for similarities and differences within and between interview transcripts and observation field notes (ADOLPH; HALL; KRUCHTEN, 2011);
- Go beyond a description of particular occurrences to identify the patterns that occur, and thence model the ongoing inquiry process through which project actors tackle project situations (LALONDE; BOURGAULT; FINDELI, 2012);
- Do not wait more than a few days to analyze the data already documented;
- Compare new data constantly against previously observed data and concepts (ADOLPH; HALL; KRUCHTEN, 2011);
- By interpreting the empirical material gathered in the process of prolonged active interviewing and collaborative participative interpretation of accounts reflecting experiences of project practitioners, we can generate alternative understandings of what goes on in project practice (CICMIL, 2006).

Outcomes

- Project documentation analyzed;
- Causalities and relations among data collected created.

Observations

- This step must be continuum and every new code, information or documentation must start it;
- If some theory is guiding the research, also synthesize a gap analysis each proposition or theory.

Adaptation tips

- This is a mandatory activity. The main objective of the approach is to be able to analyze project and teams' actuality. Use inside meetings to confirm some analyzed ideas.

Performers

- Researcher

5.12 Closing Remarks

This chapter presented part of the main goal of this research, the approach to analyze and understand project actuality, as well as helping software teams to engage in reflection and project rethinking. For each activity it was presented its goal, income artifact, exit criteria, outcomes, steps to be conducted, observations if any, adaption tips and performer. The adaptation tips focuses in a practitioner that wants to execute the approach in his/her organization.

Some comments were also pointed out based on the six case studies presented but it is not part of the approach. The approach modeled with BIZAGI can also be seen in Appendix C.

In the beginning, the approach meant only to observe, analyse and understand project actuality. After the first two organization, the reflection and interventions were added in order to make a different in the scenario observed. This final version is based not only on the literature review, but also on the experience of conducting the six case studies using the approach.

6

Actuality Findings

Sometimes we feel that what we do is just a drop in the sea. But the ocean would be less if it lacked a drop.

- Mother Teresa of Calcuta

This chapter presents the research field, the *in vivo* sample and its actuality as we observed, analyzed and understood. The time line of the case studies execution is also presented. Moreover, the most relevant and common problems and its causalities discovered during the case studies. In addition, actions executed during action research phase are also presented here.

As explained in Chapter 3 all organizations were analyzed based on aspects that emerged from the field. Each aspect has at least one related research sub-question. This chapter presents the context, the characterization and the actuality observed and analyzed by using the approach described in this thesis and the analysis driven by the research sub-questions and other drivers that emerged along the research.

Among the drivers that were analyzed for each organization in the sample, we have PMBOK adherence, Project Management Process from MR-MPS-SW adherence, and dimensions (organizational, team, project and individual) analysis. Fig 6.1 depicts once again the analyzed dimensions and its factors.

All data was collected using the approach defined in Chapter 5. For the first 4 case studies, just the analysis results will be presented. The last two, organizations *E* and *F*, will present besides the analysis, evidence of the action research, as an example of the traceability from actuality observed to actions suggested along the approach execution.

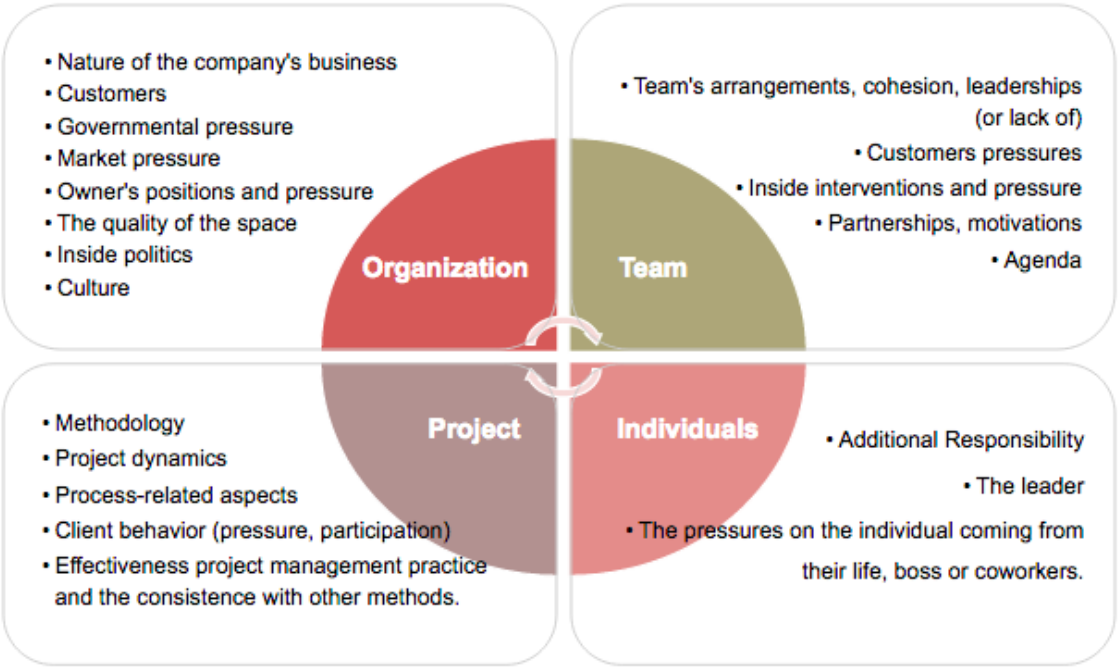


Figure 6.1: Analyzed Dimensions and its Aspects . Source: own elaboration.

6.1 Qualitative Research Timeline and The Approach Readiness

The major challenge in this research method is the amount of detailed data collected and the time required to conduct observations (EASTERBROOK et al., 2008). Due to time limitation, only up to two organizations at a time were involved, to guarantee at least two visits per week to each organization. Figure 6.2 presents the timeline in which the first two *in-loco* studies were executed. During the first two studies, the initial approach version was used. It focused only on observing and analyzing the project actuality. These studies as well as the SLR were responsible for the biggest change in the approach, to include the reflection steps in it. Although the initial idea was to refine the approach and give visibility about the project actuality phenomenon, we resumed the project in order to execute the reflection a little later, after updating the research tools and the approach.

With the refined approach, the new set of studies began. First just organization *C* was willing to engage in the research and was feasible due to the infrastructure.

In the end of 2013, two other opportunities appeared for the coming year, organizations `D` and `E`. Along the second semester of 2014, we got the opportunity to present and discuss the approach in a doctoral symposium (SAMPAIO; MOURA, 2014) and an international conference

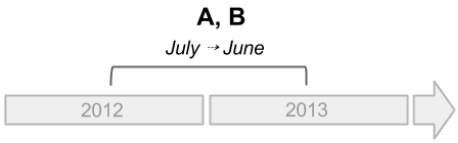


Figure 6.2: Research Field Preliminar Timeline

of project management (SAMPAIO; MARINHO; MOURA, 2014a). Further long, in February 2015 the thesis qualification also provided feedback and the approach was once again refined. There was no huge changes, just adjustments such as the division of as activity in two to clarify its steps or the merge two activities that complemented each other. The final version of the approach was used in organization *F*. Figure 6.3 presents the timeline for the remaining studies.

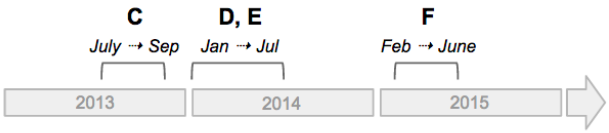


Figure 6.3: Research Field Timeline

6.2 Observation Sample

Our research sample is composed by organizations in the Northeast of Brazil. Five of them from the city of Recife (`A`, `B`, `C` and `F`) and two of them from a small city over 700 km away from Recife (`D` and `E`). To be able to visit and observe `D` and `E`, it was necessary 70 minutes flights. The visits to organizations `D` and `E` were sequential, to maximize the trip, since the transport time was the longest.

Organization `B` was the biggest one in the sample, so in order to better organize the data, we will refer to organization as `B1`, for team 1, and `B2` for team 2. Each team dealt with different demands and projects. Same solution was given for the organization *F*. Figure 6.4 presents some detail on the organizations and the research field data, in order to facilitate the findings presentation.

Org.	Projects	Project Duration	Technology	Team	Years Old	# of Clients	Project Type
A	0, 3	3-4 weeks	Delphi and Java	1 PM+D, 5 Dev, 2 T+S	10	More then 10	New, Maintenance
B1	3	5-8 weeks	Delphi	Team 1: 1SCM+Dev, 1 PO, 2 T, 5 Dev, 1CM,	28	Around 10	Maintenance
B2	2			Team 2:1SCM+Dev, 1 PO, 1 T, 3 Dev, 1CM,			
C	2	2-4 weeks	Java	1PM+PO, 1SCM+Dev, 2 Dev, 1T+QA	13	2	New, Maintenance
D	0	2 months	Delphi	1 D, 8 Dev + S	20	Over 150	Maintenance
E	0, 2	2-4 weeks	C\# with EXTJS, Delphi	1 D + dev, 5 Dev	14	Over 300	New, most Maintenance
F1	2	4 weeks	html 5.0, css	5 Dev (1 SCM), 1 Designer,1 PO, 0.5 T	15	Over 70	New Sites and Solutions
F2	0,1			5 Dev (1 SCM), 1 Designer,1 PO, 0.5 T			

Figure 6.4: The Research Field

Column **Projects** presents the number of projects observed. It presents "0" every time in the beginning of the work where there was no development work structured as projects. For organizations `D`, even though we introduced project concept, it was not possible to monitor one project up to its ends and throw the important moments and meetings. The **Project Duration** column defines the size of the project once it started to happen. In addition, column **Technology** states the technologies used by the organizations. The column **Team** presents roles that were presented in the project or development team. The roles were part time or full time. This information was not considered. The nomenclature can be understood in Table 6.1.

Table 6.1: Organization's roles.

Role	Acronym
Project Manager	PM
Developer	Dev
Tester	T
Support	S
Requirements Analyst	RA
Scrum master	SCM
Product Owner	PO
Product Manager	PD
Configuration Manager	CM
Process Quality Assurance	QA
Designer	Designer
Director	D

Only roles directly involved with the team were documented. Organizations `B`, `E` and `F`

had a support team, which was not observed by this research.

The column **Years Old**, presents how old was the organization in 2014. Even though some studies occurred before this period, we chose to state the same year to all organization along the multiples case studies. Column **# of Clients**, gives an idea of the approximated number of active clients the organization used to have. At last, the column **Project Type** represents the type of projects. All organizations involved in the research had at least one product that they maintain. Some of them also worked as software factories, and developed projects from scratch.

Only organizations B and C were organized as projects. A, D and E worked on demand. F had one team organized as project (*F1*) and the other were organized as sprints (*F2*).

In order to execute the case studies, and to collect the data depicted in this chapter, at least 70 hours were spent in each organization. The formal hours spent in each organization is presented in Table 6.2. Informal activities such as lunch and coffee out of work it are not included. Only case study effort and the intervention planning was considered for this Table. The intervention effort was not included because it was not measured for all the organizations.

Table 6.2: Research effort

MSE	Case Study Effort
A	72
B	139
C	78
D	81
E	77
F	112

The following section presents project actuality on the organizations on the sample. For the analysis driver dimensions and PMBOK, as explained in Chapter 3, we analyze if the factor was not represented or Absent (0), partially present or with medium impact (1) and present or that causes a high impact (2). In addition, the MR-MPS analysis' driver followed the MA-MPS (WEBER et al., 2005).

6.3 Project Actuality Phenomenon: Organization *A*

6.3.1 Characterization and Context

Organization *A* is situated at the Porto Digital (Productive Arrangement of Information and Communication Technology) located in Recife, capital of Pernambuco. With nearly 10 years of experience in the IT industry, founded in 2004 to provide solutions in industry management, service management and trade management. Organization A is the one in the full sample that besides their product, had some "software house" market. They have a product developed in Delphi (Maintenance) with firebird and one in Java JSP, a proprietary tool that supports activities'

management. They use the SVN[1] for the Java product and services. Their business strategy combined selling their products, that required a lot of adaptations to its deliver and implantation, maintenance for existing clients and new project by demand.

The team had five developers, two of them programed in Delphi and three in Java. There was a support analyst that occasionally helped with tests. An new support came along in the first month of the case study that later on also helped on testing activities. Although their activities were mostly to attend clients demands and first doubts. The new “projects” were all to the Java programmers, in mean while Delphi programmers took care of their main product.

The entry time was flexible, but it was expected to start up to nine. Lunch time was also flexible. Usually their morning started at 9am with one-hour lunch break, besides Tuesday and Thursday, when the entire staff had English lessons, paid by the organization. Some of the team member use public transportation (3), another came by bike (around 15 km), one had a motorcycle and the Delhi leader and the owner had a car. Besides the owner, they all usually eat close by.

The owner was also the manager. He used to centralize all decisions. In addition, he did not allow things to go different from what he liked it and he passed along the pressure he received from their clients to his team. He was in his low forties and graduated in computer science and also had a post graduation degree in management. Although he was really good on convincing everyone to do what ever he wanted, his management skills were not as good. He had the knowledge, but did not believe that using traditional techniques would make any difference.

The office environment was noisy and the Delphi team was demotivated and tired. Although there were many maintenance demands for the Delphi team, the few clients that got in and out had a nice relation with the organization and team. One issue that we could not deal with in our research was the overwhelming amount of governmental demands. It was uncomfortable to see how hard it was for the Delphi leader to deal with so many changes and demands from govern, support, client, emails, phone and manager. Besides the Delphi leader, that was also a senior developer, and the owner, we dealt with a young team.

They have large customers with the Java product but also dozens of customers with the Delphi product. In addition, they were building a partnership with international groups, which the owner did not share the name but our findings shows conversations in English and Spanish and some were clients, or at least demanded tasks to be done by the Java team. All the improvements, changes and fixes were agreed with the client and hardly met the deadline. Typically, other demands of other customers hinder the ongoing demands.

There isn’t the concept of project management or project. Unless demanded by the client there was no project plan. It was an operation that had some goals and that new priorities and customer pressures trampled the planning. The newer product has a little more predictability in delivery, but the "feeling" of the estimate is still very macro. "We estimate based on the average of old demands how long is going to take us to deliver". For some rare demands, they

[1] http://tortoisesvn.net/

used a schedule in Microsoft Project that help the estimation, but almost never used the project concept in general and the schedule was not used for monitoring the demands. The most expected problem to deal with was how to overcome the inability to estimate correctly and precisely. The organization had almost no process or related.

The office space and machines were new, clean and organized. Even though the place was little, the building it was situated in had meeting rooms and a little kitchen for each floor that could always be used. Although they did not had their own meeting room, they could use the building facilities that have several rooms available for that purpose. The building is fairly new and no major problems, except with the lack of a shower. A problem for the programmer who used to ride a bike to work.

There was no work cycle or meetings, the owner calls his team ad-hoc or they communicate whenever is necessary. Therefore, it was not easy to define the strategy to observe them. The only way was to have a sit around and observe.

6.3.2 Dimensions Analysis (A)

This section summarizes the analysis for the dimensions: organization (Table 6.3), team (Table 6.4) and individuals (Table 6.5) for organization *A*. There was no analysis according to the project dimension due to the lack of project on the organization. As already mentioned, they organized themselves in an operation. This section shows drivers related to the sub-question "What external and internal factors influence the project and teams".

Table 6.3: Dimensions Analysis: Organization (A)

Factor	**Analysis**
Governmental Pressure	A strong government pressure was seen in this organization due to the Delphi product for sales automation. It had to be compliant to the new legislation imposed by the government. For every month we were there at least one argument was observed due to this new legal features or change request from the government. Among the three project that occurred along the case study, two of them also treated legal demands. As it was a demand to their clients as well, the climate surround those changes were not good.
Market Pressure	The market pressure was normal for a software house, but their biggest complaint was to the price charged by their competitors, regarding their Delphi product.
Customer Pressure	There was not a single observation day that the phone did not ring, or even a client stopping by to see how something was going. According the Delphi leader, "things lose their priority because we give in to pressure ...". Mostly the Delphi demands were prioritized by whom ever pressures the most.

There was no project running during the execution the the case study. Along the use of the approach it changed. Considering the demands, there was no project management effectiveness

Table 6.4: Dimensions Analysis: Teams (A)

Factor	**Analysis**
Cohesion	Although we call the programmers as “team” in our notes and memos, there was no team concept. For that reason, that was no cohesion between them.
Customer Pressure	Since the leader programmer was also a partner, the pressure passed by through the organizational leaders and straight to the team. Once again, every observation day has evidences of client’s interference and pressure.
Leadership	There was a centralized management. And a lack of leadership skills, if we consider that a good leader delegate. The absence of owner typically made forced the team to stop. They were so used to him prioritizing everything that the evidences shows that they could not decide against an obstacle what needs to be done.
Owner Interventions	The owner interventions or interference was also a constant.

Table 6.5: Dimensions Analysis: Individuals (A)

Factor	**Analysis**
Motivation	A lack of motivation on the team was observed. The Delphi team demotivation was visual to everyone. Even though it does not come out in the interviews, their daily faces said so.
Outside life Interventions	The Delphi leader programmer had a new born child and some times he had to help out, and for that he got absent some times.
Additional Responsibility	Once again, the Delphi leader as partner had to deal with some things that took his time away. Mostly the clients took his peace.
Proactivity	Some proactivity in the Java team members. Mostly this characteristic was easier to see when we started the reflections.

and a lot of pressure from the owner and manager. Since he could change the demands priorities due to client pressure, every time he got pressured, the team got pressured. And as there was not a team structured, the pressure was in each individual. As they shared the room with the support analyst and the clients called and email so much, we considered the client as present on the project daily routine. Besides all the meetings that they attend to.

6.3.3 Adherence to MR-MPS-SW (A)

If you considered that they did not have any project, once again the entire adherence to the model would be a zero or "N" as not implemented. But, we went further and we tried to identify what was the artifact or result that would answer the question, regardless the project concept. Each result from the Project Management Process in MR-MPS-SW (SOFTEX, 2012), in its first level of maturity, was analyzed following this strategy. The Tables 6.6 and 6.7 presents this analysis.

Table 6.6: Adherence to Project Management Process from MR-MPS-BR (A - Part I)

Result	**Expected Result**	**Comments**	*A*
GPR 1	Scope Definition	For the Delphi team we had a list of demands and features to be produced along the year or period. Although the next priority was always the demand from the most impatient client. Besides, the legal demands also had priorities and it was set to be delivered in a specific version (Month A or C). Every two months they had a product delivery, and some requirement were pointed to be delivered at that moment. We considered that a scope partially defined. The Java team had list of requirement and they had to deliver according to the date established with the client. The list of requirements were occasionally transformed into a WBS (New projects).	P
GPR 2	Products and task estimation	The estimate was only feeling on when to deliver. No task or product was estimated according to it size or complexity.	N
GPR 3	Life Cycle definition	There was no process or project/job life cycle established. Although every two months they had a new version for the Delphi product. All other deliveries were done in the end of the demand, as in a traditional life cycle.	N
GPR 4	Effort and cost estimation	The cost estimation was one of the biggest frustrations for the owner/manager. As he did not have any visibility of his operation, the only tool he had was to plan by month. If one month costs "X", then if a demand looked like it would take four months, he would charge for the cost plus the margin he wanted to get. No effort estimation was done. Although we have considered partially implemented, due to the monthly way to see charge and the ability to translate a month in hours. 176 hours for each employee per month involved in the demand.	P
GPR 5	Schedule, milestones and budget definition and maintenance	No schedule was established. The only milestone would be delivery day. The budget was the monthly one already mentioned, and the owner took care of it. He would usually set with the client a schedule two weeks after the date he gave to the programmers, but they did not know about that. Often it was not enough, but some times the strategy was good enough to meet the goal date.	P
GPR 6	Risk Identification	No risk was identified.	N

Table 6.7: Adherence to Project Management Process from MR-MPS-BR (A - Part II)

Result	**Expected Result**	**Comments**	*A*
GPR 7	Human Resources and knowledge definition	The human resources were always the same, but its definition, monitoring vacations or training necessities for the new project or demand was never done.	N
GPR 8	Other resources definition	Although they had new equipments, and it was enough for their accomplishments, there was no planning for hardware or software necessary for the project or demand.	N
GPR 9	Project data identification	There was no data identification and definition of privacy of any kind in the organization.	N
GPR 10	Establish a Plan	There was no project plan or related.	N
GPR 11	Project viability analysis	Once opportunity came along, it would be analyzed by the manager and at least one programmer, regarding its viability. Along the observations, the manager beliefs were the most taken into account. After the selling moment, there was no viability analysis.	P
GPR 12	Project Plan revision	There was no project plan or related.	N
GPR 13	Project Parameters Monitoring (Scope, schedule, cost and estimates)	There was no monitoring of any kind, besides the "monthly-budget". The WBS was done more as a tool to show how many months would take the demand. As mentioned by a Java programmer "After the planning the schedule turns into a painting in the wall, is never actualized".	N
GPR 14	Project Parameters Monitoring (Human and non human resources and data)	There was no monitoring of any kind.	N
GPR 15	Risk Monitoring	The risk concept was never seen along the observations.	N
GPR 16	Stakeholder involvement	It was considered partially due to the support analyst as a channel of communication with the client. Besides, that the implantation was always planned, involving both parties.	P
GPR 17	Milestones review execution	No milestone was established besides the end date.	N
GPR 18	Problem identification and analysis	They lived their problems. Never stopped to write them down and analyze them.	N
GPR 19	Action response	No action plan was established.	N

6.3.4 PMBOK Analysis (A)

There was no PMBOK (PMI, 2008) adherence observed for organization *A*. As already established, there was no project concept defined. Most of the control was empirical and there was not any evidence that supports any PMBOK adherence. A feel initiatives were considered for the work done and the final analysis is presented in Table 6.8.

Table 6.8: Adherence to PMBOK (A)

Knowledge Areas: * Management	In	P	E	C	Comment
Integration	0	0	0	0	Not seen
Scope	X	1	X	0	For the Java new "projects", demands that came from clients or real projects, they had the scope as their list of work tasks. For that, they would elicitate the requirements and had a WBS for Java demands.
Time	X	0	X	1	Time as a deadline was controlled, but not the schedule itself.
Cost	X	1	X	0	The cost was estimated by number of weeks or months would take to deliver the work. And the margin expected was added to compose the price.
Quality	X	0	0	0	Not seen
Human Resources	X	0	0	X	Not seen
Communications	X	0	0	1	The communication with the client was a bit controlled. They had product forecast, clients demands and change requests documented, email with the clients are also evidences.
Risk	X	0	X	0	Not seen
Stakeholders	0	1	0	0	We considered partially planned due to the support analyst dedicated to the client, and also due to a email in the begging of a demand concerning everyone understanding. In this last case, for new demands (Java).

6.3.5 Research challenges in Organization *A*

Organization *A* was the one with the lower number of hours per visit. Some times the English teacher got there and got the only empty sit, besides occasionally team members went straight to the client. And many where the time that the owner did not come in. In those days, that noting would happen, two hours of noting happening, we decided to “call it the day” and resume in another visit.

6.4 Project Actuality Phenomenon: Organization *B*

6.4.1 Characterization and Context

The organization *B* has its activities centralized in product maintenance, which enables the entire business activity. They do not even consider themselves as a software organization, but a "commercial, inventory and distribution business' solution organization".

Organization *B* was the oldest and biggest one in the sample. In order to organize the data, we divided them as *B-1* and *B-2*, for teams 1 and 2. With 28 years in the market, founded in 1986, there were three development teams, although we focused only in *B-1* and *B-2*. All organization's activities focused on carrying out products existing functionality maintenance, usually corrective, adaptive or evolutionary. The organization had two solid products, with the biggest clients, also partnership with other organizations that combined they presented an even more solid and wider solution. The two solutions, or its variation, were used by multiple clients. In order to take care of this product usually the activities were development, testing, implantation and support. Our research focused on the development and testing team. Although they dealt with some implantation activities once in while.

Even though the project type for organization *B* was maintenance, they also had a different team doing a new product, demanded by a new client, in the related market. There was no project established and the deadline was further then our research goal deadline. For that this team was out of our scope. As presented by the Chief Executive Officer (CEO) "our enterprise is not a software factory. It is a business enterprise that delivers specific solutions to a specif market"(PD[2] 34:2).

If a client wants something different but still related to the one they already have, they will get the challenge to gain a new (but similar) market. This team was not part of our sample. Both observed teams (`B-1` and `B-2`) worked in two distinct Delphi products that used to be a single bigger product. It also matter to point out that two members were shared and their work was punctual, so they were less than part time team members. They were not really considered as team members by the team. They were responsible for the branches, releases, configuration activities and process audits. Team B-2 was the oldest in the sample. Most of them has been working together for so long (more than ten years) that seamed like a family. Team B-1 had young programers and senior programers non of them older than 30 years old.

They had level G of MPS-SW (SOFTEX, 2012) and the work was already organized as project. Although the lack of indicators and visibility to the higher management showed several weakness in its process. Their process was also based on Scrum (SCHWABER, 2004) with two weeks sprints, although B-1 had deliverable (release) almost every other day. Something more important, more urgent, forgotten demands came up and haunted their plans and peace. Their demands were not centralized on the PO. Besides the PO, the demands and pressure came

[2]PD for Primary Document in the Atlas.Ti. The first number means the PD and the second the quotation.

from plant manager, CEO, everyone seamed to ask for changes. In addition, there was a lack of priorities definition. All evidence, in every single one of the observations and documents showed a "Software Firefighter team" (B-1). Out of the entire sample, *B-1* had the longest work day, usually due to changes and delays and a permissive scrum master.

The factory manager was responsible for all operational teams: three development teams; and the support team. He was the one who open the door for our research. He had almost 15 years of experience in IT market, and in his late thirties, had just ended a master course. He always listened to us and reflected along the research, but usually client demands came first and dealing with problems, enhancing process and knowledge in second. We had several reflections meeting suspended due to his other appointments. Our work spot was also close to him, although most of the time the research happened in one of the three meeting rooms. Some of his decisions were based on his own desires not on what was the best for the organization.

They had also a Product Owner (PO) for each team. The PO' workspace was in another floor and they usually lacked of time to even attend their the 2 meeting per month. In our research we considered them as team members. Both POs were graduated in computer science or similar and in their low forties. They once were programmers and now they work more as a business analyst and product managers. In our research, we focused only in their PO's activities. They have been working in the same organization for over 10 years. The PO from B-1 always fought for the clients best interest, regardless of the sake of the his team. Evidences shows lack of commitment with his team or organization's process. Team B-2's PO was part of their family. Last pressure, last changes and more cohesion among them was always a constant.

The teams sited across a large room in a square, facing out and with an island in the middle. The manager also cited in the same room. The organization had its own building and a huge recreation room used during the lunch hours. Flat screen tv, pool table, foosball table, chess and large cushions by the kitchen and eating area. Every week they had one fruit day, where the organization offered fresh fruits by the coffee and water station. Most team members used a uniform polo t-shirt, but its use was not mandatory. The main researcher also got one, and used at least once a week when visiting.

Although they were organized in sprint, they did not have "closing process". Neither project or sprint were analyzed in the end of the cycle and no reflection, retrospective was used to improve their process and daily routine.

Part of team's actuality is presented in Figure 6.5.

6.4.2 Dimensions Analysis (B)

This section summarizes the analysis for the dimensions: organization (Table 6.9), team (Table 6.10), project (Table 6.11), and individuals (Table 6.12) for organization *B*. This section shows drivers related to the sub-question "What external and internal factors influence the project and teams".

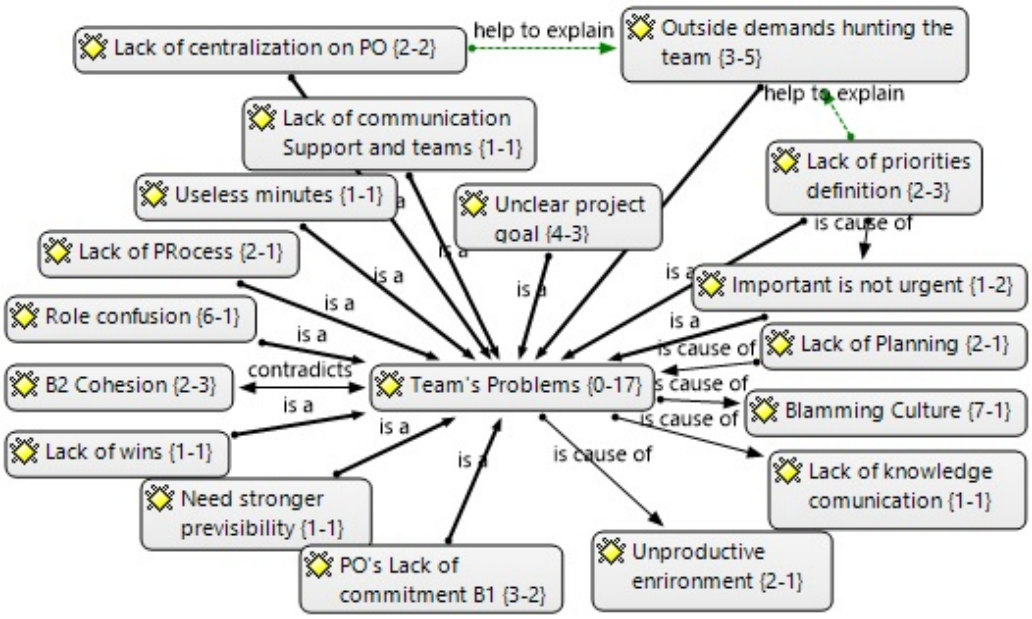


Figure 6.5: B team's Actuality

Table 6.9: Dimensions Analysis: Organization (B)

Factor	**Analysis**
Governmental Pressure	There was always a legal demand being done along the observation. Although we did not see that much suffering from it. A strong government pressure was considered due to interviews responses (PD 36:2).
Market Pressure	As the organization was not a software house, they already had their clients and we did not see much market pressure. The sales manager occasionally asked team *B-1* to tasks due to the market.
Customer Pressure	An intense and continuous pressure was seen to the organization. From that, more towards teams B-1's product.

Table 6.10: Dimensions Analysis: Teams (B)

Factor	**Analysis**
Cohesion	The organization had employee with long years with them. That was one of the reason to turn into a cohesive group. The problem was maybe the business analyst's fault, maybe the documentations fault, maybe the Po's fault, but they stick together. As they new and worked together for such long years they turned into cohesive team. *B-2* was as cohesion as a happy family. They stood by team decisions no matter what, including the PO. We considered *B-1* as partly due to the PO and the test members.
Customer Pressure	The client did not call or pressured the team directly. Although business analysts, sales manager, PO, plant manager, CEO and everyone pressured by the client would pass part of the pressure to the team *B-1*.
Leadership	The teams' leaders were the scrum masters. Both scrum masters were strong leaders. As senior programmers and long years in the organization, they were respected and also respected everyone in the team. The scrum master from team B-2yielded to pressure more easily. Sometimes the pressure made him focus only in his programmer activities.
Owner Interventions	Although we saw the interventions, most of them was due to clients demands, and lack of portfolio management. The pressure and interventions were more intense in team *B-1*.

Table 6.11: Dimensions Analysis: Projects(B)

Factor	**Analysis**
Management Pressure or interference	The pressure was mostly on team *B-1*. As already mentioned, it was the client pressure coming down to the team. Some times the plant manager would take someone from the team, even the scrum master to do some tasks and still wanted everything from original scope done.
Client Presence	The client was not present in any occasion.
Effectiveness Project Management	Although it was seen a lack of management capability, this aspect was considered partially due to project management activities present on their routine. They had a project plan, they estimate focusing on the time, they had monitoring activities, minutes from those meetings. The plan contemplated most of the resources, data and others. Even though it was poorly executed. A bigger picture of this lack of management capability is seen in Figure 6.6.

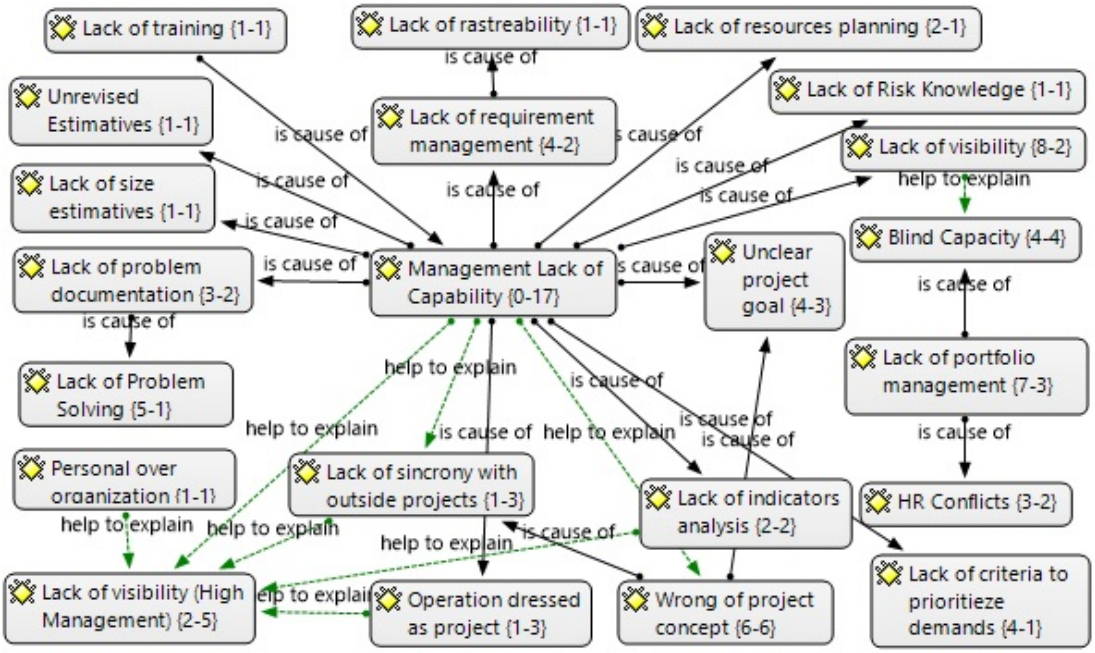


Figure 6.6: B's Management Capability

The project to *B* used to be the sum of demands to be delivered, from several different clients, or just one. Most of the time, there was no synchrony in between outsides project (the ones sold to their clients) and the ones executed by the teams. This kind of management would not be "wrong" if it had any outside project monitoring. This misunderstanding leads to a lack of visibility and also unclear goals to the team. Besides, it brings many unnecessary changes. This also explain why the priorities are never settled. One developer form *B-1* said "once the phone rings, we discover that the date was set with the client and we do not have four months do get it done, we just have four days"(PD 34:3).

6.4.3 Adherence to MR-MPS-SW (B)

The analysis considered their process and actions. The analysis focused on Project Management Process in MR-MPS-SW (SOFTEX, 2012), in its first level of maturity. The Tables 6.13 and 6.14 presents this analysis.

6.4.4 PMBOK Analysis (B)

Both observed teams had similar finding, considering PMBOK adherence. As only the Scope Management was different, the results will be presented as organization, not as team separately. Table 6.15 presents the PMBOK (PMI, 2008) adherence for organization *B*.

Table 6.12: Dimensions Analysis: Individuals (B)

Factor	Analysis
Motivation	Team *B-2* was well motivated. Their partnership with the PO helps to explain this motivation. Team *B-1*, was also motivated, but not always. They had their ups and downs. The part time members, QA and CM, did not seam to be as motivated as the rest of them.
Outside life Interventions	The scrum master from team *B-1* was about to get married and did got married along the research. Besides, he and another developer were studying. Exams interfered with their work. Although they tried hard to make up for it.
Additional Responsibility	Team *B-1*, mostly the scrum master was taken away to do some work in the client or to implant a version or similar.
Proactivity	They always got things done. Even when the PO was unavailable to the scrum meetings, they found a way to keep working. This characteristic was stronger in team *B-1*.

6.4.5 Research challenges in Organization *B*

Organization *B* the biggest challenge was dealing with practitioners' personal interests on the research. Several times during the presentations to validate the data, the information could be questioned if it did not look good for management.

6.5 Project Actuality Phenomenon: Organization *C*

6.5.1 Characterization and Context

Organization *C* with almost 13 years old was the most mature one. It used to have level G of MPS-SW (SOFTEX, 2012), but it had recently expired. Also small, the organization had a nice office that was renewed during our work. Some troubles and problems came from that moment. Although the owner was from IT world, along our research we never saw him with the team. He received and approved proposals and budget, from his desk. It was a family business, although the Project Management (PM) was not part of the family. The study initiated with one PM and changed along the way. The change was frightening, but the team got more cohesive, less bureaucratic and productive after this change and along our study. Besides the developers, one tester, quality assurance that could also develop made the team. All team was young and in their lower twenties. A support analyst was mostly away, but they shared the office space. A part time trainee tester was also involved during the project. The project manager that came along the research, was a senior experienced manager in his low fifties that was great to work with. All the programming was in Java and their work were organized in projects.

Organization C had only one real client, the government, but it was a solid relationship, with more than one department, that had been going on for almost a decade. Up to that moment,

Table 6.13: Adherence to Project Management Process from MR-MPS-BR (B - Part I)

Result	**Expected Result**	**Comments**	*B1*	*B2*
GPR 1	Scope Definition	From many demands, the requirements pointed out by the PO in the scrum meeting used to be the the project's initial scope. It the first scrum meeting of the project, they would point a few more requirements. Those should be prioritized in case of impediments or left to second project sprint. The focus was mostly in the sprint but the teams had the definition of the priorities current sprint, plus some more. The scope was documented in minutes and it was also in the project plan.	L	L
GPR 2	Products and task estimation	They used planning poker but the cards reflect hours of work, not complexity or size. Team *B-2* had an initiative of changing it by calibrating the story point to the number of hours, but it was just in the beginning of it.	N	P
GPR 3	Life Cycle definition	They had a process that pointed out that an iterative and incremental life cycle was used. Along the project they had at least two incremental cycles.	T	T
GPR 4	Effort and cost estimation	There was estimation for the hours using planning poker. Although it did not include QA, CM, data base or Planning activities such as scrum meetings or planning the project.	P	P
GPR 5	Schedule, milestones and budget definition and maintenance	They did had a schedule and also milestones, although the schedule had low activity description. The budget was never seen along the work. It was taken cared by the CEO and his assistant. In some point in time the demand was estimated and never reanalyzed by the team, that many times not aware of the given estimations.	P	P
GPR 6	Risk Identification	Some risk identification was done, but very poorly. There was no risk taxonomy available to help them. Most of the risks were pointed by the scrum masters and team. The PO, initially responsible for the project plan never helped with that.	P	P
GPR 7	Human Resources (HR) and knowledge definition	Most of the time and projects, the HR was defined, but some times when change happened, team *B-2* forgot to update the plan during project planning regarding to any change on team's capacity. Team *B-1*, more used to the change, kept it more actualized the project plan for the new team capacity.	L	P

Table 6.14: Adherence to Project Management Process from MR-MPS-BR (B - Part II)

Result	**Expected Result**	**Comments**	*B1*	*B2*
GPR 8	Other resources definition	All the resources necessary to the operation was defined in the project plan model. All projects contemplated this resources planning.	T	T
GPR 9	Project data identification	All data management was also defined on the template, so all project plans had data management planning. The specific data was also actualized.	T	T
GPR 10	Establish a Plan	There was always a plan, in the beginning of the project, although it was poorly managed.	L	L
GPR 11	Project viability analysis	Viability analysis was never done.	N	N
GPR 12	Project Plan revision	The plan was never revised by the plant manager as supposed to.	N	N
GPR 13	Project Parameters Monitoring (Scope, schedule, cost and estimates)	The scope and estimates were not monitored by team *B-1*. Team *B-2* monitored and controlled their scope change and other parameters. Only cost was not sB - een.	N	L
GPR 14	Project Parameters Monitoring (Human and non human resources and data)	The resources were not monitored by team *B-1*. Team *B-2* monitored and controlled all project resources and data, although	N	T
GPR 15	Risk Monitoring	Risk was poorly seen by B-1's scrum master. Moreover, risk management was not a systematic in this organization.	P	N
GPR 16	Stakeholder involvement	The plan had all the scrum's ceremonies planned and the moments of everyone's involvement. The monitoring was not as strong as the planning.	L	L
GPR 17	Milestones review execution	There was no indicator analysis or retrospective. No closure activities were seen. No reflection or lessons learned from the project or sprint was done.	N	N
GPR 18	Problem identification and analysis	The bigger problems regarding the sprint were documented, but poorly analyzed. Only the symptoms were seen not the causes.	L	L
GPR 19	Action response	Ever since only the problems' symptoms were seen, only the symptoms were treated.	P	P

Table 6.15: Adherence to PMBOK (B)

Knowledge Areas: * Management	In	P	E	C	Comment
Integration	1	1	1	0	There was no project charter. Although as they were not a software house, the teams always worked in the same product, and the PO represented the many clients, it was not a problem. They had project plan with scope, human resources, communications, stakeholders, effort, schedule and the reference for the risks management plan and scrum spreadsheet. In addition, the scrum master did the work orientation.
Scope	X	1	X	0/1	Scope was planned by both teams and managed and controlled only by team *B-2*. Although the major focus was only on the sprint.
Time	X	1	X	1	They do not use an WBS. All ceremonies are in the schedule along with the milestones. All the requirements for each sprint are discussed. Besides the total effort listed in the plan, the scrum spreadsheet, referenced in the plan had each requirement and time planned to its execution. Although, some support activities were not planned.
Cost	X	1	X	0	We did not see costs or budget. The CEO told us it was planned during the "client project" the cost and the budget, but we never saw it. He also told us that they did not monitored planned X executed.
Quality	X	0	0	0	Only the beginning of the quality assurance was idealized, but was still really preliminary and ad hoc. No plan or procedure was written. The person to execute quality assurance had just been hired.
Human Resources	X	1	0	X	Human resources are planned but the execution was not monitored, considering the team development.
Communications	X	1	1	0	All ceremonies are planned with the communication results. The execution was management, although if the PO was not available, there was no action of control to overcome the problem.
Risk	X	1	X	0	Risk was poorly planed and not controlled.
Stakeholders	1	1	0	0	The stakeholders are identified, and all involvement is planned and documented in the plan. As they always have the same ones, since the PO represents all clients, most of the information is on the project plan template and used in every project. They lack of managing and control the engagement of all stakeholders.

Table 6.16: Dimensions Analysis: Organization (C)

Factor	Analysis
Governmental Pressure	There was a small government pressure. The impact was not regarding their product or services, but regarding their client that was the government.
Market Pressure	There was a pressure to compete in new bids, and to stay competitive on this kind of services. They were struggling to find new opportunities.
Customer Pressure	We saw the client frequently calling the team as well as the project manager. It didn't seem to bother the organization but there was a small pressure.

this was the hardest organization to leave, since it felt so natural to work and research with them. Some of them goes home to lunch, some of them stays around to leave earlier due to college times and related. Nevertheless, pretty much the entire organization used to be together from 8am to noon and from 2pm to 6pm.

The evidences shows that they tried to expand in the market by looking for new city or state government as clients. And by offering its products and services to them. They also were alert for new bids related to their products. The owner and the new manager were responsible for finding new opportunities. We did not see much return from this sales. However, as they had at least two solid products (solutions), they seam to be optimistic with the market. Along our research we also helped them accomplish some certifications goals.

They were a cohesive, motivated and proactive team. There was no pressure coming from the manager or the owner. Client was not close but phone calls and emails showed some pressure. Although they were not there on the market, there was some pressure to be ready for the governmental bids and opportunity.

Among the PMBOK areas, there was *C* was the organization with the second most adherence. Besides risks management, cost management and quality management, there are results and components to endorse partial adherence to all the processes. Before and after the new manager, the organization had management practices maturity.

6.5.2 Dimensions Analysis (C)

This section summarizes the analysis for the dimensions: organization (Table 6.16), team (Table 6.17), project (Table 6.18), and individuals (Table 6.19) for organization *C*. This section shows drivers related to the sub-question "What external and internal factors influence the project and teams?".

6.5.3 Adherence to MR-MPS-SW (C)

The analysis considered their process and actions. The analysis focused on Project Management Process in MR-MPS-SW (SOFTEX, 2012), in its first level of maturity. For

Table 6.17: Dimensions Analysis: Teams (C)

Factor	**Analysis**
Cohesion	Maybe because it was such a small team, but they were a very cohesive team.
Customer Pressure	As mentioned, the customer would frequently call. Even though it was not a bad call, the team always felt a little pressure.
Leadership	The new manager was not seen as their leader. The multitasking designer was their leader.
Owner Interventions	The observation findings does not show any intervention from the owner. Although when asked the project manager said that there was some pressure, but he tried not to pass to the team.

Table 6.18: Dimensions Analysis: Projects (C)

Factor	**Analysis**
Management Pressure or interference	No pressure was seen coming from the manager.
Client Presence	The client was not present.
Effectiveness Project Management	The manager was really experienced and all the practices already institutionalized showed evidence of maturity and effectiveness.

Table 6.19: Dimensions Analysis: Individuals (C)

Factor	**Analysis**
Motivation	Everyone seems motivated. Happy faces, relaxed, a motivated group of individuals was seen.
Outside life Interventions	No outside life intervention was seen.
Additional Responsibility	Everyone had to do more than one task, besides one of the programmers. Although as this activities were mostly for the team, it was not a problem. Besides the manager that had to deal with new opportunities and sales, the team had activities related to programing and something else.
Proactivity	All team members,besides one programmer, were proactive. It was a great group to research with.

organization *C*, the Tables 6.20 and 6.21 presents this analysis.

6.5.4 PMBOK Analysis (C)

Out of all the organizations in the sample, *C* was the most mature regarding the project management activities. The aspects it needed to be improved were those they did but did not get any benefit from it (risk management and cost management) or yet they executed, but did not plan or controlled using best practices from theories (Quality - test). Table 6.22 presents the PMBOK (PMI, 2008) adherence for organization *C* and the comments will be presented along this section.

Related to the adherence to the integration management knowledge area, we observed that:

- A document similar to the project charter was generated. It was an executive summary of the new project. It would be sent to the owner for his approval or adjustments. It had the overall number of hours, the scope, the client involved and the team. A project plan was created after the project executive summary approval. It was based on the regular template. Along the project they always had work orientation and management. The scrum board helped with that. Changes would be managed and integrated to the project , although they did not have a integrated tool for management the change and controlling all the other artifacts impact and analysis. The initiation and planning was stronger than its execution and control.

Related to the adherence to the scope management knowledge area, we observed that:

- The scope was planned, requirements described and documented into a tool called MANTIS. They did not had a detailed WBS, but the macro activities were established. The scope was monitored with the help of the scrum board and MANTIS, but there was no complete impact analysis on the change.

About the adherence to the time management knowledge area, the following practices were observed:

- The executive summary and the project plan had the effort planned and a macro schedule with major activities and milestones. The activities were only in the MANTIS [3] tickets. It all would go to the scrum board, but there was no sequence of implementation, only priorities established. Although if some ticket had to be done first due to its dependencies, it would had bigger priority. The schedules as its was only macro, it never had any change. The effort some times could change but it was not monitored.

[3] https://www.mantisbt.org/

Table 6.20: Adherence to Project Management Process from MR-MPS-BR (C - Part I)

Result	**Expected Result**	**Comments**	*C*
GPR 1	Scope Definition	The project scope was defined in the project plan as well as in the project executive summary, document equivalent to the project charter.	T
GPR 2	Products and task estimation	The process had the description of the planning poker method. All tasks had its complexity estimated using such method. The activities related to planning, monitoring and test had just effort estimation.	L
GPR 3	Life Cycle definition	There was a documented process that presented the life cycle. As projects were short (a month long), they used the traditional life cycle with only one delivery at the end. The sprints were used to internal verification and validation. The project plan referenced the process.	T
GPR 4	Effort and cost estimation	The effort was planned in both project plan and executive summary. The cost planning documented in the executive summary. The cost estimation used only the effort plus tax, forgetting aspects such as infrastructure or related.	L
GPR 5	Schedule, milestones and budget definition and maintenance	The budget was never seen along the observation. The executive summary listed the cost and the macro activities on the schedule. The schedule was also on the project plan. Once a dependency was noticed in between requirements or tasks, it was defined as a bigger priority the one that generate the dependence.	L
GPR 6	Risk Identification	All risks were identified, although more as a mechanic thought and practice. Looking only to the direct artifact that would be a “T” for the implementation, but as we observed, we saw that many risks were not considered and analyzed as it should. When questioned, the team would agree that it was poorly executed.	P
GPR 7	Human Resources (HR) and knowledge definition	All necessary human resources were listed in the project plan. The roles were described in a different document, were all roles and responsibilities were written. There was a misunderstanding on the training planning, that was always done outside of the project. All associated documentation were analyzed. We pointed another "L", although once again, looking only to the evidence, it would be a "T". It was considered other available data and confirmation interviews.	L

Table 6.21: Adherence to Project Management Process from MR-MPS-BR (C - Part II)

Result	**Expected Result**	**Comments**	*C*
GPR 8	Other resources definition	All resources were described in a organizational document (Resource Planning) and referenced by the project plan. Whenever something specific came out, it would go to the project plan. The project environment, tools, everything was listed.	T
GPR 9	Project data identification	All data were identified, planned and documented in the project plan. The project plan the list of all data and for each data it was listed who has the access to write or consult and where it supposed to be.	T
GPR 10	Establish a Plan	A plan was established in order to guide the project. All necessary documentation was referenced.	T
GPR 11	Project viability analysis	The viability was analyzed before the beginning of the project and also along the project.	L
GPR 12	Project Plan revision	The owner just focused on the executive summary, artifact that came before the plan. He did not revise the plan. The team would be presented to the plan, but not as revisers. It was considered the revision on the executive summary and the presentation to the team.	L
GPR 13	Project Parameters Monitoring (Scope, schedule, cost and estimates)	Besides costs, all project parameters are monitored. The cost would fail to be actualized if some activities took longer then expected.	L
GPR 14	Project Parameters Monitoring (Human and non human resources and data)	All project parameters are monitored.	T
GPR 15	Risk Monitoring	There was some evidence pointed out that the risk were monitored, but poorly. Almost no change at all would happen along the project since its planning.	P
GPR 16	Stakeholder involvement	Stakeholders were identified and documented on project plan. All the communications and ceremonies involving stakeholders, from outside and from inside the organization, were planned, executed and monitored.	T
GPR 17	Milestones review execution	The milestone review was conducted as planned.	T
GPR 18	Problem identification and analysis	Problems were documented and analyzed. Once again most of the time it focused on the iceberg top, not on the root of the problem. But the data analyzed was solid enough for largely implemented.	L
GPR 19	Action response	Action were established but not necessarily monitored to see its effectiveness and conclusion.	P

Table 6.22: Adherence to PMBOK (C)

Knowledge Areas: * Management	In	P	E	C
Integration	2	2	1	1
Scope	X	2	X	1
Time	X	2	X	1
Cost	X	1	X	0
Quality	X	0	0	0
Human Resources	X	2	1	X
Communications	X	2	2	2
Risk	X	1	X	0
Stakeholders	2	2	1	2

About the project cost management, it was observed that:

- Once again only the focus of the cost planning was on the operation cost. It was planned and documented in the executive summary, although if one task would take more time than planned, it was not actualized and the cost would be outdated. A budget was never seen.

Related to quality management, it was observed that:

- Only test activities were executed, although the only planning was due to hours of test. So we did not considered as quality planning nor execution. Although it got close to get a 1 for execution.

Related to resource management knowledge area, it was observed that:

- The project executive summary and the project plan had all the human resources planned. As the team was always the same, it was always mobilized and ready. They were also managed although we did not see the "developing the project team" being planned or done. Once again it got really close to a “2”.

Related to communication management, it was observed that:

- The project plan had planned a communication plan and it was executed as planned.

Related to risk management, it was observed that:

- Risk was identified but it was not really used or controlled. If someone assessed only the data would say that they were adherent, but the systematic was wrong and they did not use this area to their benefit.

Related to stakeholder management knowledge area, it was observed that:

- Stakeholders were identified and documented in the project executive summary and in the project plan. All the communications and ceremonies involving stakeholders, from outside and from inside the organization, were planned and executed. If for some reason an appointment or ceremony did not occur, an email was documented about it. The "1" for execution was due to the lack of engagement management.

6.5.5 Research challenges in Organization *C*

It was really easy to carry the research in organization *C*, no challenges were found. A fixed place to st was arranged and the trust was easily built. The team was committed and great researchers in action.

6.6 Project Actuality Phenomenon: Organization *D*

6.6.1 Characterization and Context

In arid area in the Northeastern of Brazil, organization *D* has almost 20 years of experience in a well established market, since 1996, with an ERP (Enterprise Resource Planning) product, distributed to over 150 clients. The product was built in Delphi. The majority shareholder has been at the organization's forefront from the beginning and acts as project manager. This single product, with some variations for market niche is the organization's business model basis.

New product development activity is rare or nonexistent. We observed some necessary adjustments for a new client or market niche, or more common to comply with the Brazilian legislation. One new product came out, with the same *kern*, but different features to attend to a new niche. In order to take care of this ERP and its variations, usually the activities were: product maintenance, implantation and support. The demands came from reported bugs, legislation changes, or some changes related to a new implantation or clients.

In the beginning the entire team did everything (support and development tasks). Later on, our intervention changed for two focused teams: the development team focused on developing and maintaining. The support team took care of the other activities. The team started with 9 members and it ended up with almost four, since one developer was on support duties as well. 3 out of 9 where doing doing an internship, um as a developer and the other 2 as support analyst.

The facilities were simple, but every employee had his own workspace (bay). Outside the workroom there was a refrigerator, a restroom and enough room to walk. In the end of the hallway there was a training room. The owner's room had a large glass window (2 meters tall and 2,5 meter long) that usually was opened to talk to the team in the next room. The room of the developers and support analyst room holds 11 employees, in a large U form. Almost everyone facing the wall. Although almost every employee has its phone and they had a proprietary

software to communicate, the owner/manager still would open the window and yield to call whoever he needed.

The organization did not used projects to conduct their work. There was no traditional planning activities. The planning was limited to an annual plan with legal demands and other necessities for the product new version. Although we did not see it been followed. Frequently, in the beginning of the week, the manager sent an email with what he wanted to prioritized, but even those demands were ran over by other priorities. According to the owner all the new customers came from his first contact. Actual clients was called him. All decisions and directions for the team passes through him. We did observed dozen of phone calls, but even more phone calls got to the team.

Organization *D* was the hardest one to commit to the research. They had the nosiest office, and the worst scenario. In addition, it took the longest time to build trust and finally engage in action. The owner was really busy selling, but he messed everyone's always. He gave a percentage in the society to his two best employees, both with over 15 years working with him and a excellent developer and he had the strongest knowledge of their tools. The other was was with him almost from the beginning and was great with clients, great knowledge on the product and could also develop. The observations made clear that the business environment had a strong influence in the team's demotivation.

About the culture, they had a 2 hours break for lunch, when 100% of the organization went home. As a small city, everyone either walked home or used motorcycle to do it. According to a few interviews, they were used to take a nap every day in the lunch break. Many times the first researcher waited outside with a temperature of over 35 degree Celsius, but the thermal sensation out in the sun felt like 45 degree sun until 13:58 when all team started to get in. They had a 15 minutes break every four hours shift, called depressurization moment, usually used for coffee, snacks and stretch. Figure 6.7 presents some organizational culture aspects observed along the research.

6.6.2 Dimension Analysis *D*

This section summarizes the analysis for the dimensions: organization (Table 6.23), team (Table 6.24), project (Table 6.25), and individuals (Table 6.26) for organization *D*. This section shows drivers related to the sub-question "What external and internal factors influence the project and teams".

It was also part of their reality an unproductive environment, due to many reasons, as presented in Figure 6.10.

There was no project concept, for that the project dimension could be suppressed. Although Table 6.25 is presented to once again discuss the pressure present due to the owner be the manager and also the problems due to his lack of management capabilities.

As they did not have any project concept, they also lack of winning sensation. The team

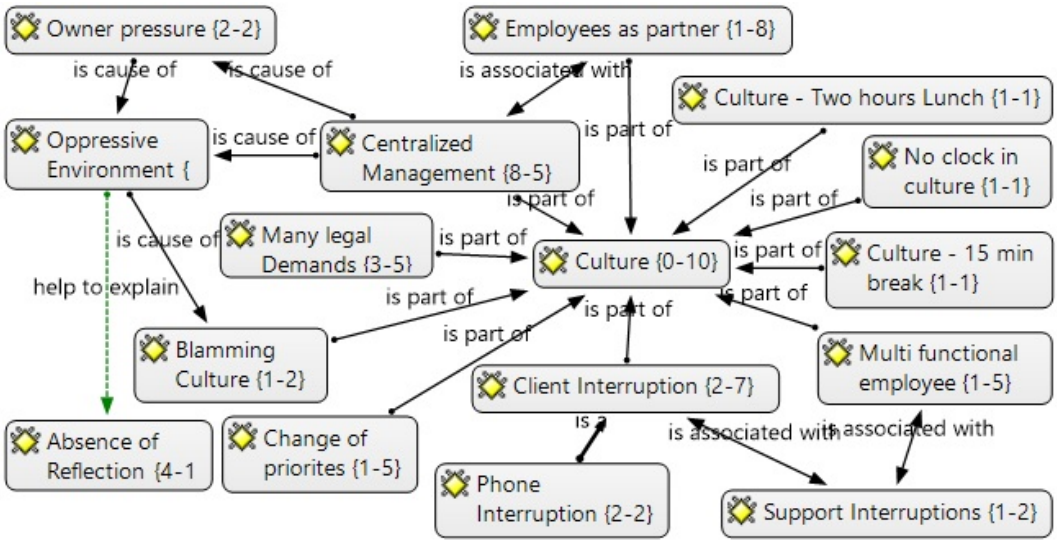


Figure 6.7: Culture Network for D

Table 6.23: Dimensions Analysis: Organization (D)

Factor	Analysis
Governmental Pressure	The government represents the major customer or disturbing factor in the organizational context. Interview show a great deal off pressure and disorder due to this scenario. "We have many legal demands"(PD 16:18).” The government makes things more difficult, because the software can only be maintained in the market if it is adhering to the legal requirements coming from Caixa, ministries... I have no idea what the impact of these legal changes in my business. One example is the HomologNet - the manual says one thing and the screens says another’s”(PD43:7). They felt outdated due so many legal demands (PD 15:7; 43:12). Figure 6.8 presents the network of evidences about the government impact.
Market Pressure	The market pressure was little. Their solution also comprises the payment control. And that many organizations with similar solutions avoid exactly due to the many legal changes. Most of the impact was due to the legal changes and the necessity to be complaint to the legislation.
Customer Pressure	The pressure on the organization was high. According to the owner, the client’ mentality is that we are paid to do, so we have to do it" (PD 16:25). They called the owner, the employees and the organization. And plans would change due to that influence.

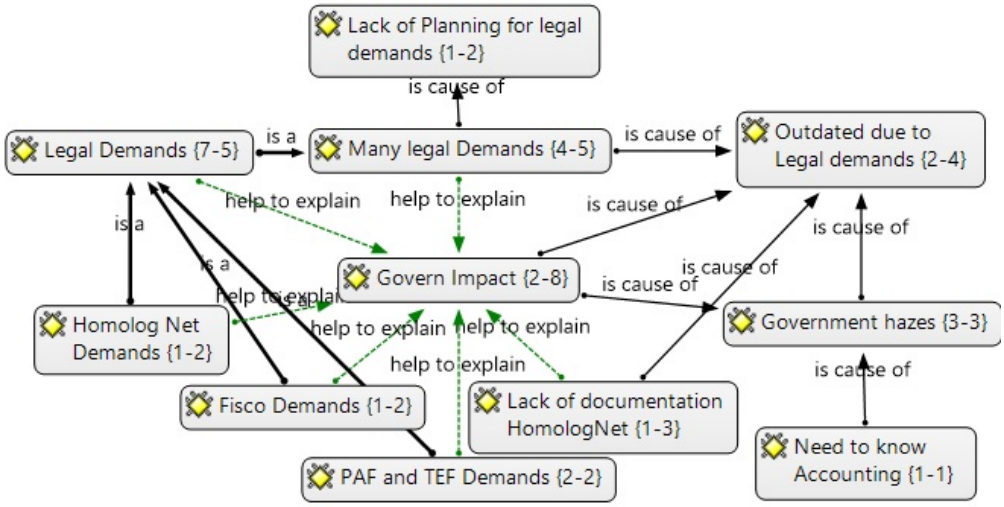


Figure 6.8: Govern as an external disturbing factor (D)

Table 6.24: Dimensions Analysis: Teams (D)

Factor	**Analysis**
Cohesion	The group of employees did not look like a team. There was a lack of cohesion. Sometimes, they tried to find out who was to blame for a bug, instead of understanding how it could be overcome.
Customer Pressure	. The Client's interference was a constant. All notes and memos presented the same. Once it was said "The customer wants us to go there and do it for him ... does not want to listen "do it alone"(PD:43:13)." They would call teams' personal phones to ask for something.
Leadership	Some leadership came from the oldest employee. He was not just great with clients, he was great with everybody. And most of the leadership skills and presented by IPMA (ASSOCIATION et al., 2006).
Owner Interventions	The owner was responsible for an oppressive environment that caused a seeking for guilt and the blaming culture. His effort to impress new clients or the pressure he suffered made the situation even worse. His centralized management made it worst, because the team needed him for everything and he was not always available. Along our research he traveled twice to outside the country and also to the south. In addition, he gave classes to other entrepreneurs. Anytime he was around, the climate was tense. Figure 6.9 presents a network regarding the owner's pressure on the team and interventions on the operation.

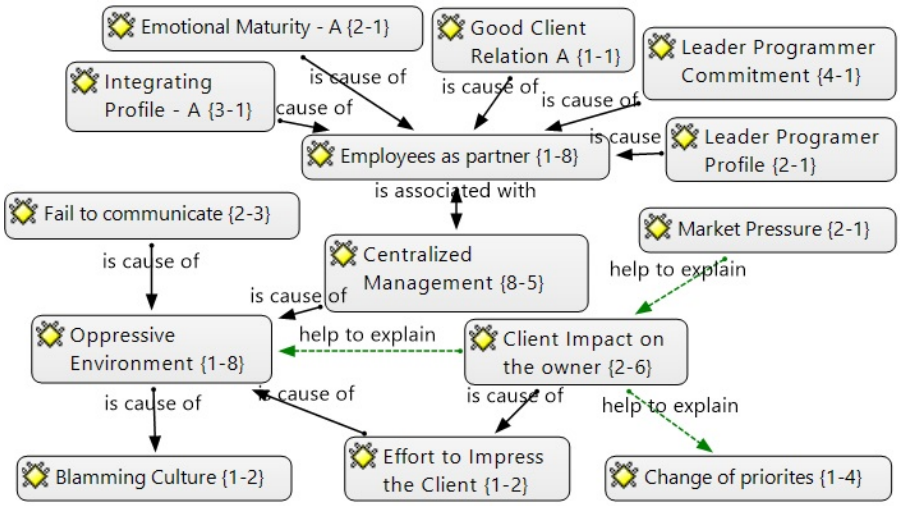


Figure 6.9: Intern disturbance factor: An Oppressive Owner

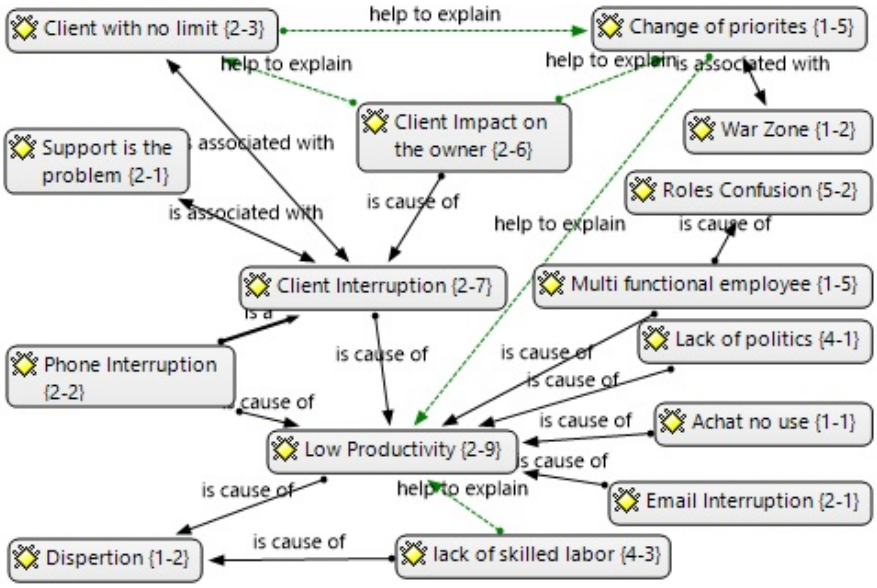


Figure 6.10: Productivity

Table 6.25: Dimensions Analysis: Projects (D)

Factor	**Analysis**
Management Pressure or interference	As the manager was the owner, the previously explained pressure is applicable here.
Client Presence	Although the client was not present on the organization, he was by the phone. The owner also represented many clients, since they had to maintain the product and the owner always decided what would get done. For every new product adaptation for a specific client, they visited the client (with the owner) usually close by.
Effectiveness Project Management	All evidences show a lack of effectiveness on the work management.

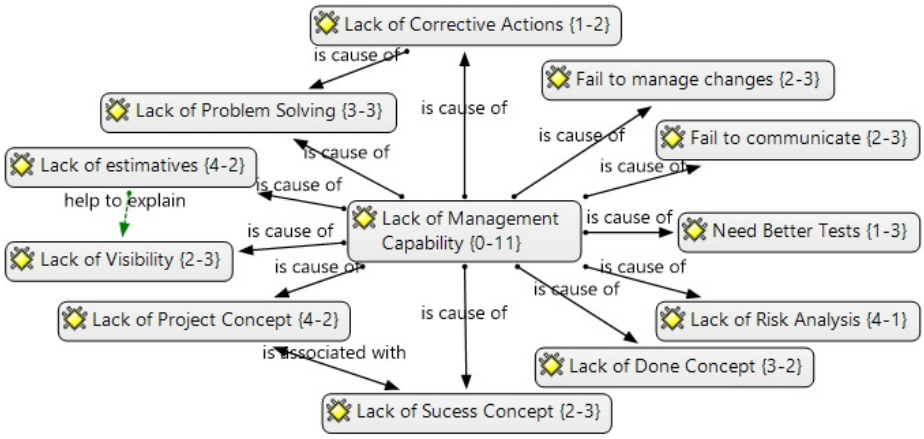


Figure 6.11: Management Capability

Table 6.26: Dimensions Analysis: Individuals (D)

Factor	Analysis
Motivation	There was a lack of motivation present on the entire team. The lack of motivation had many reasons. The client and phone interventions, due to the profile of multifunctional employee. The oppressive environment did not help bringing an motivational environment. In addition, they had interns on the team, sum that with the oppression and lack of motivation, leading to a lack of commitment. The network displayed on Figure 6.12 presents some relations regarding the lack of motivation.
Outside life Interventions	The senior developer had family and had to leave earlier to get his daughter at school. The support leader told us, in a ride to the hotel, that had a disease and for that was seeing many doctors. The owner was involved in politics and also used to give classes to entrepreneurs.
Additional Responsibility	Due to the multifunctional profile they all had to be creative, delivery product versions and work as support analyst.
Proactivity	Even though there was this unhealthy oppressive environment, many employees were proactive and were great researchers in action. At least towards our case study they were proactive.

was always doing something and the sensation was that they were always late. Many were the problems due to this lack of management capability. Problem such as lack of visibility due to lack of estimates and others presented in the network on Figure 6.11.

6.6.3 Adherence to MR-MPS-SW

This section presents the analysis focused on Project Management Process in MR-MPS-SW (SOFTEX, 2012), in its first level of maturity for organization *D*. Once again since they did not have any project concept, we needed to considered planning and control initiatives. The Tables 6.27 presents this analysis. The results GPR 8, GPR 9, GPR 10, GPR 12, GPR 14, GPR 15, GPR 17 and GPR 19 were suppressed due to the lack of comment. Since no evidence was observed, analyzed or presented a “N” was established for not implemented.

Table 6.27: Adherence to Project Management Process from MR-MPS-BR (D)

Result	**Expected Result**	**Comments**	*D*
GPR 1	Scope Definition	For the partially was considered the annual planning for the legal demands and also the weekly email with the prioritization.	P
GPR 2	Products and task estimation	No estimates were done	N
GPR 3	Life Cycle definition	They did not have a life cycle. Every demand that was ready, was released.	N
GPR 4	Effort and cost estimation	The cost considered the entire operational cost, and the usually time they took to delivery. Very crafty, but they had a cost planning.	P
GPR 5	Schedule, milestones and budget definition and maintenance	No schedule or milestone were seen.	N
GPR 6	Risk Identification	Never a risk, a threat, a uncertainty was considered.	N
GPR 7	Human Resources (HR) and knowledge definition	As they have a fixed team and they always had training on the product for to strengthen their knowledge, based on the mistakes and most asked questions to the senior developers, we considered it partially adherent.	P
GPR 11	Project viability analysis	Often the owner consulted the senior developers, if the time planned was enough and if it could be done.	P
GPR 13	Project Parameters Monitoring (Scope, schedule, cost and estimates)	Somehow the weekly planning email had many answers responding how was the development and other tasks designated to them. Even though it was not much, it was a base for future monitoring the project.	P
GPR 16	Stakeholder involvement	Considered the emails and the tool to monitor clients demands. The tool even showed the time had elapsed since the its demand.	P
GPR 18	Problem identification and analysis	Considered the problems that motivated the trainings.	P

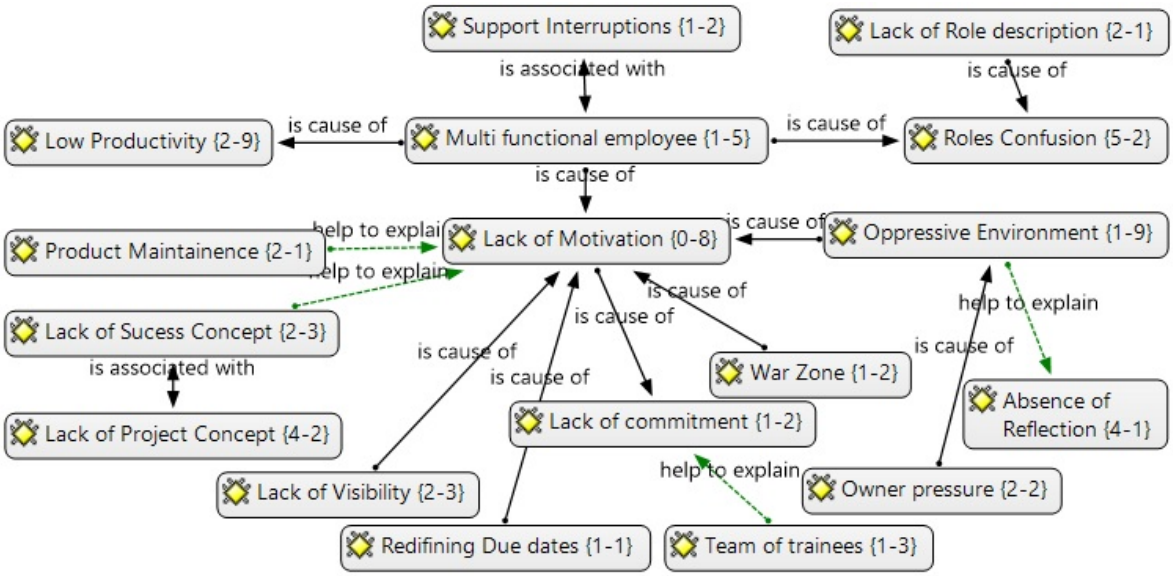


Figure 6.12: Team's motivation

6.6.4 PMBOK Analysis

As explained in the last section, we considered initiatives of planning, monitoring and control in order to show some related adherence to the PMBOK (INSTITUTE, 2013). It was not easy, since most of the processes and its components had no representation on the actuality observed. The analysis of the adherence for organization *D* presented only a "1" for planning and implementing the Project Scope Management. For the one we considered that the requirements were identified and they were either on the support tool, or on the emails from the manager and the priority of the week was established by email.

Quality management knowledge area seeks to ensure that the project meets the specifications for which it was idealized. It means planning and managing the quality of projects for the planning process, execute quality assurance for the execution process and control the quality for the monitoring and control process. For a software development project, it means planning and executing test, quality assurance and other quality control activities to achieve the specification. Figure 6.13 exhibits the quality scenario for organization *D*.

6.6.5 Research challenges in Organization *D*

The distance limited our visits to two consecutive days every other week. So it took longer to get team trust and blend as similar. Moreover, by far organization *D* was the hardest one commit to the research. The owner was centralizing and he brought difficulty the reflection involving the entire team. The action research plan and the reflections were more successful during his month of vacation.

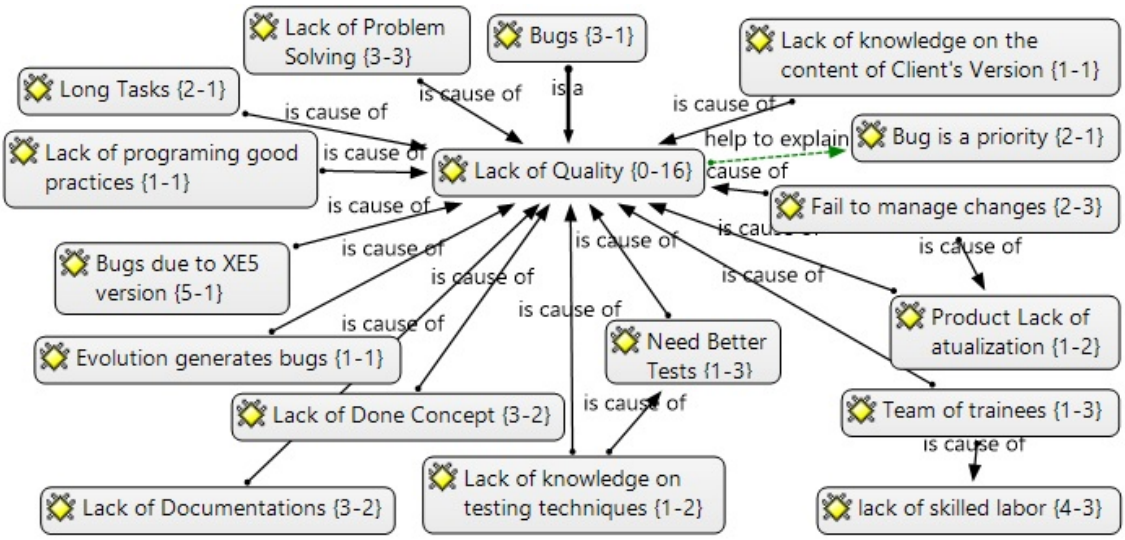


Figure 6.13: Quality

6.7 Project Actuality Phenomenon: Organization *E*

6.7.1 Characterization and Context

The organization *E* was 17 years old. The product manager, here also called project manager or technical manager, got in the society in 2002 when they started developing programs and solutions for Retail Trade Automation. Nowadays, their organization's business model basis is a main product, some variations of it and a few small products spread, maintained and supported to over 300 clients.

(E) had their main product in Delphi, new ones being converted to Delphi mobile, but 50% of the team were allocated to migrate the main product to C# with EXTJS. The small team of six developers is divided in two groups. Three of them deals mostly with software product maintenance and adaptation for other segments. Using mostly Delphi or Delphi Mobile technology. The others three developers deal with product modernization, porting it to a new technology, C# with EXTJS. Once in while, they help the others team members. Among the 6 developers, we count the product manager. Even if sporadically, he also programed and helped the Delphi demands. He is the one that defines what will be done and how it will be done.

They also had support services that were not analyzed by our research. It was located in the same arid area in the northeast of the country as *D*. They had most of their clients in PE and BA, two northeastern states in Brazil.

Three employees were young and in their first job. Some immaturity was clear, but their discipline towards what was given showed commitment. Three programmers were still studying, two of them at night. The one that studied during the day was just part time (30 hours a week). The other two never went to college. Besides the Leader Delphi programmer, they were all from 20 to 24 years old. The product manager was the oldest in the team and he was just 28 years old.

The part time team member was the best team programmer, besides the product manager. He could deal with Delphi, Delphi mobile, C# and Java. He was also the last one to integrate the team. They were a young, nice and committed team.

Out of them all, Organization *E* had the most technical project management (the product manager), also one of the two owners. They both manage sales. One owner, the organization founder, took care of the support team, which was responsible for the implantation and client services, out of our observation scope. He also dealt with organization's finances. Our contact with him was very punctual. His idea of cost management was the amount of income with the Product license or new demands (later called projects) versus the entire operational cost (development team, support team, infrastructure and owner's salary) (PD 13:9). The other, the product manager as he called himself, was a great researcher in action and enthusiast of our work and research. He managed to learn quick, try hard to rethink, reflect and move forward. He also managed the development and also acted as a developer once in while. In summary, the small organization was structured in two teams. One with 6 programmers including the owner, the other with six employees dealing with support plus the administrative owner.

They had a daily operation. The support demanded and they would delivery. A new bug was identified or a Fisco demand (legal demand) would come, they would delivery. With multiples releases every month, it was the kind of operation good enough to make money but with no visibility. Neither it was good enough to have an idea of how much work could the team take or when they could deliver.

The progress analysis was based on, if the ongoing task (from the client in the other end of the phone line) was finished. As the tasks were usually long, it demotivates the team for not seen any progress or delivery day after day. No metrics were used and there was no done concept for the team to go home with the feeling of mission accomplished. No one ever verbalized the frustration, but it felt that it was never an end, or a victory.

One of the aspects observed in Organization *E* was the fact that they struggled with configuration management. They had many releases a month, and some times a week. Leading to lack of time due to much time merging and building the release. Besides, as presented in Figure 6.14, every change came with a huge deal of effort to analyze the impact, due to no traceability tools. As they worked with an ERP installed in over 300 clients, they sure had changes request.

One affirmation related to this problem, conversation between a support analyst and the product manager:

> "This guy again? We just finish sending a delivery and he already has another one? It is the fifth release this month."(PD3:3)[4]

Or the conversation between the Product Manager and the Delphi full time programmer:

> "[Product Manager] So, X have you found the solution? [X][5] Not yet, I am still

[4]PD for Primary Document in the Atlas.Ti. The first number means the PD and the second the quotation.
[5]Consider X the name of the Delphi full time programmer

analyzing where do I have to adjust."(PD 5:4)

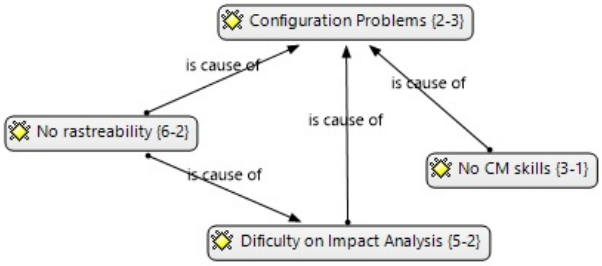


Figure 6.14: Configuration Management Problem (E)

The organization changed its headquarters along our research. The research had to stop for almost three weeks. But it turned into a nice, new, organized and modern place, with meeting room, training facilities, with cosine and much more space. They went from renting to owning their place.

Figure 6.15 presents some organizational culture aspects observed along the research. Everyone has two hours lunch break, when everybody went home. Four out of six programmers, used motorcycle as transportation. Since they worked in long tasks, they were often frustrated with their lack of progress. Although they loved the place, they worked in. Since the owners where friendly and they treated everyone well, the place was brain new and it was a great new installations.

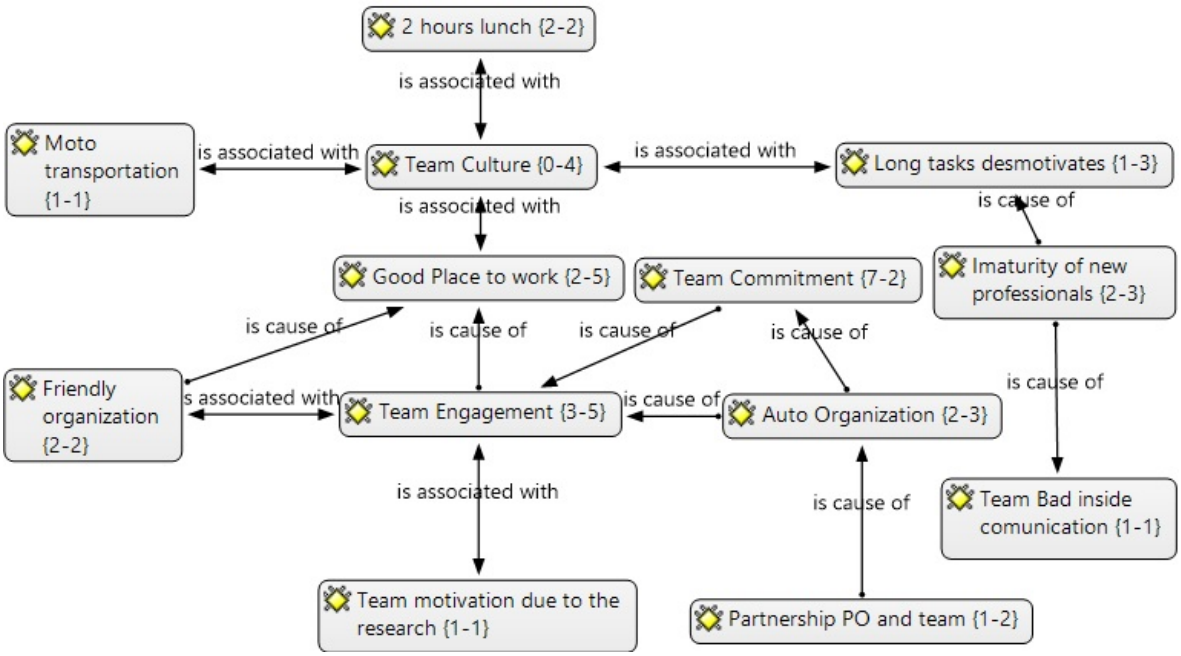


Figure 6.15: Culture Network

Figure 6.16 presents the overall scenario of Organization *E* actuality.

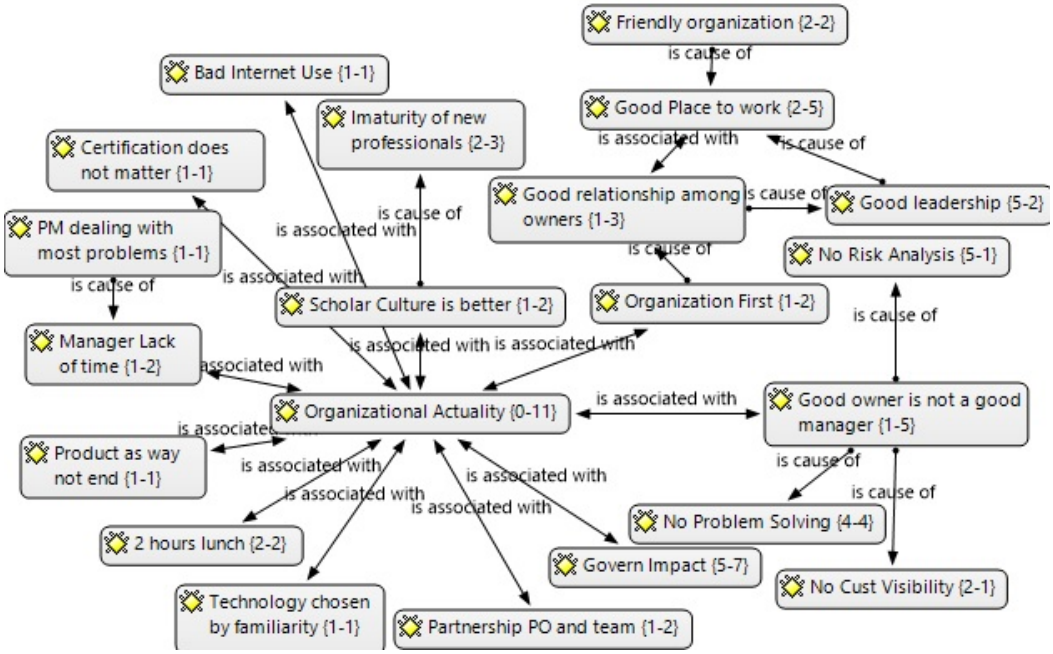


Figure 6.16: Organizational Network

6.7.2 Dimensions Analysis

According to the dimensions, the following Tables 6.28, 6.29 and 6.30 presents some observations on the findings related to the dimensions. The Dimension project was not exhibit due to the lack of projects in the beginning of the work.

Table 6.28: Dimensions Analysis: Organization (E)

Factor	**Analysis**
Governmental Pressure	There is 7 entrances in the Atlas.ti pointing to problems or impacts due to the Govern demands and pressure. The Figure Govern as a external disturbing factor, represents this phenomenon. One opportunity of services came out from this pressure. That is why a high impact was attributed to this factor.
Market Pressure	Along the months of the study no evidence of market pressure was seen. Although once asked, the said that there is a small pressure from the market due to the govern pressure and the timing to release new Fisco's demands. Only a partial impact was attributed to this factor.
Customer Pressure	Clients did not pressure the organization, maybe because they were hundreds of them. But as they needed to receive calls, build a support team to communicate and to take care of clients, it is considered as "Partially" this pressure. Only a partial impact was attributed to this factor.

Regarding the organization dimension govern pressure and impact, *E* had this external disturbance factor. Every project had something done in order to attend govern demands. Although govern was pointed as an enemy (both the product manager and the programmers), the impact was not as hard as in some other organizations. As the product manager said, once we present some findings:

> "Our worst enemy is the government's treasury, because it generates monthly demand for us that overloads us. We have to do NF 3.1, SPED, NFCE. Today still uses the 2.0 layout and it will die.(...) We forgotten the client's Business, there is the FISCO's business. After Fisco[6]'s business, if we have time, we will take care of the client' business. Nowadays, we cannot deliver more things because the FISCO demands much and always implies new rules." (PD 13:11)

As presented by the Delphi programmer leader they were always running behind the demand. They had to reinvent themselves with new services to be sure that the roller-coaster enforced by the government did not take them out of business (PD 28:10). Figure 6.17 present the network view for the disturbing factor.

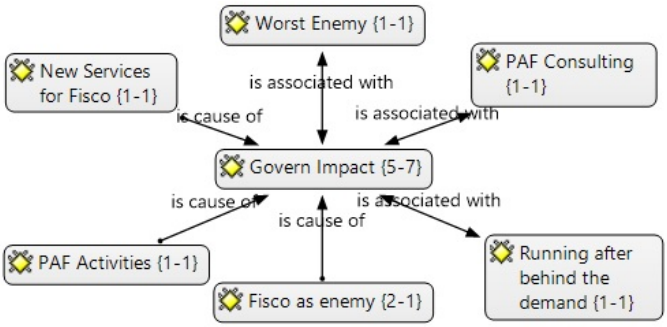


Figure 6.17: Govern as an external disturbing factor

[6]WIKIPEDIA: Fisco refers to the tax authorities. Generally to the State as Treasury Manager, regarding financial, tax, economic and financial activities.

Table 6.29: Dimensions Analysis: Teams (E)

Factor	Analysis
Cohesion	Several entrances for team commitment and a few for engagement, but still they were separated by technology and that was a problem to consider them with high cohesion.
Customer Pressure	Along the time observing and analyzing the team and its sprints and projects there was no client complaining, or interruptions. Although considering the support a kind of client, we had some pressure.
Leadership	Although we had several entrances in Atlas.ti show the leadership that the owner had over the team, still lacked of this leadership inside the team. Up to the end of the work the scrum master, evolved those skills.
Owner Interventions	This aspect was not considered an interior disturbance factor, since there is no evidence that shows these interference or interventions by the owners on the team.

Table 6.30: Dimensions Analysis: Individuals (E)

Factor	Analysis
Motivation	Most of the individual factors were discussed outside the research field, during dinner, lunch or coming and going to the airport. The motivations came from the two leaders (Delphi and C#).
Outside life Interventions	Most of the individual factors were discussed outside the research field, during dinner, lunch or coming and going to the airport. We had babies, master course, college exams, wife's sickness among others. Although besides college, no other aspect was continuous.
Additional Responsibility	It was not observed or referenced in interview any responsibility besides the ones devoted to the team.
Proactivity	Considered some quotes from the engagement code. Although they were a more reactive. The part time programmer and the C# leader had proactive moments.

6.7.3 Adherence to MR-MPS-SW (E)

The preliminary adherence summary to the *Project Management Process* from MR-MPS-SW (SOFTEX, 2012) is exhibited in 6.31. The results GPR 2, GPR 6 to 10, GPR 12, GPR 15, GPR 17 and GPR 19 was suppressed since no comments were added. No activity was observed to that supported the implementation or institutionalization of that practices.

Some other disciplines that supports the software project management were also observed and analyzed, such as Configuration management and Test. Besides, some specific aspects or activities considered related or that supports software project management were analyzed. Those activities were: Reflection and Learning, the use of management tools, communication tools and visual management boards.

Table 6.31: Adherence to Project Management Process from MR-MPS-BR (E)

Result	**Expected Result**	**Comments**	*E*
GPR 1	Scope Definition	The scope of the work was clear for the C# team. They had a list of requirements waiting for them in the Redmine. The Delphi tasks were not defined. New projects had a requirements list but it was tacit not explicit.	P
GPR 3	Life Cycle definition	They did not have a life cycle. Every demand that was ready, was released.	N
GPR 4	Effort and cost estimation	The cost considered the entire operational cost. No visibility for each demand or opportunity and no effort estimation was observed.	N
GPR 5	Schedule, milestones and budget definition and maintenance	No schedule or milestone were seen.	N
GPR 11	Project viability analysis	Often product manager consulted the Delphi leader, and the part time developer about the best strategy and the viability.	P
GPR 13	Project Parameters Monitoring (Scope, schedule, cost and estimates)	For the new projects and the C# team there was some kind of monitoring related to time and scope.	P
GPR 14	Project Parameters Monitoring (Human and non human resources and data)	There was some monitoring relates to the data that was in the svn and also to mobile devices used in some activities.	N
GPR 16	Stakeholder involvement	Besides the support available for their clients, no effort was seen related to systemically involve the stakeholders.	N
GPR 18	Problem identification and analysis	Considered the problems that motivated the trainings.	P

This aspects were somehow observed, analyzed and reflected with the organizations. The problems and also some actions related are described in the Action Research Section, the following section.

6.7.4 PMBOK Analysis (E)

There was no PMBOK (PMI, 2008) adherence observed for organization *E*. There was no project concept defined. Most of the control was empirical and there was not any evidence that supports any PMBOK adherence.

Regardless the fact that there was no project concept, the planning was based on a single requirement. As they call an ”resource”. Each resource had to be delivered in a month and no other estimation was done. As mentioned before, the cost management was based on the full operation and did not focused in the resources or group of resources. Although the product manager had knowledge about risks, he did not identify it. Problems were lived bur never analyzed it.

The support, that later on appeared as an interior disturbance factor for the development team, was structured to manage the hundreds of stakeholders necessities or complains. Somehow the stakeholders where taken cared of, but no planning or monitoring formally were done.

For the C# programmers, they knew the next requirements group to be programmed, it was reported in the Redmine, but there was no estimation, schedule, milestone or monitoring activities. Their product was not in use yet, they had less interruptions and problems to deal with.

6.7.5 Research challenges in Organization *E*

Along our research, problems emerged and we had to deal with it. Some times these problems took time from our research and set us back. For organization *E* this problems were:

- The organization changed location. Not only it was not possible to visit, but they lost more then a week of work and it took near three weeks to be back researching. New problems emerged and a lot of re-coding and re-analyzing were necessary;

- The PO and also technical owner was ending a master course. He had even less time than usual during three to four weeks;

- The C# leader Programmer had a baby and his wife had a lot of problems related. It also perturbed the visits and the flow of the work;

- World Cup took many ours of the projects and new problems emerged from that scenario. Some times one research day had 3 hours break due to games.

6.7.6 Project Actuality findings and some actions

As the actions came along the research, the entire team got more motivated due to the changes. The product manager was always present regardless the work we did. This partnership, along with the self-organization brought by the scrum techniques, also improved the team's motivation. The scrum meeting improved the communication and the entire process improve the communication with the support team.

Along the action research, many actions addressed the scenario of configuration management problems, among them:

- A Configuration Management training was offered with SoftexRecife's help. The price got reasonable and the travel costs were what really matters. The product manager and two other programmers attended to the training.
- Adoption of Redmine for managing all ongoing work. In the Redmine, the work was first organized in sprints, and further long we created the project concept.
- Once Redmine was established as tool, every new requirement was documented as a ticket. In addition, we used the "svn Guardian" to trace requirements to code. A ticket could trace to every new entrance in code. Related tickets were associated, guaranteeing requirement traceability.
- A change management process was established to facilitate everyone's understanding of step by step how to guarantee an easy impact analysis, by using all the tools resources.

In order to change the operation actuality, it was turned into two weeks sprints. We began with a week sprint and progressed to a two weeks sprint. According to the agile methods, we had:

- A planning meeting that used complexity. They had documented a few examples of trivial tasks (2) simple tasks (4), medium tasks (8), complex tasks (12), and an extra complex task (16).
- A done concept was defined.
- A review with retrospective in the end of the sprint was the moment to analyze that could go better and to review if they had a victory.
- The releases where after two sprints (4 weeks).

Later on, a project concept was established, but scope was still partially open since they knew prioritized demands would come and they would have to take it. The idea was to monitor the amount of change to be able to plan the project with the amount size. With the sprints came

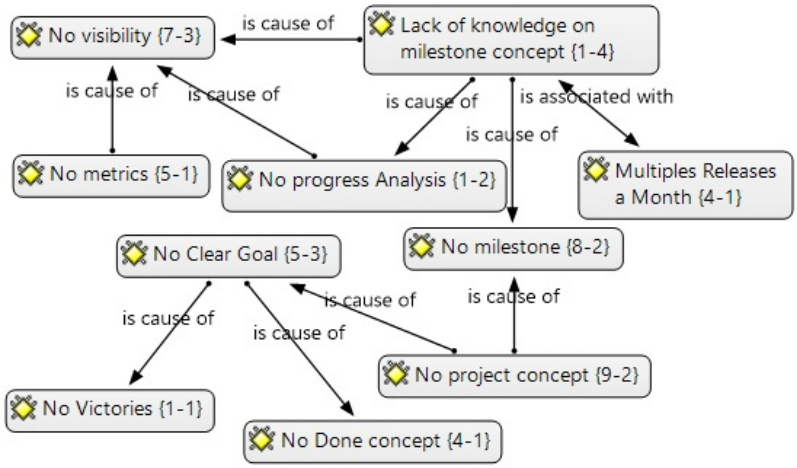


Figure 6.18: Lack of Knowledge on Milestone concept

the victories and they worked as milestone. To analyze the team's rhythm and capacity to deliver. The done concept also improved the product's quality.

Figure 6.18 present the network view for the perceived problem.

With the project concept, they started to visualize the cost of a client, a release, a new version, a project and others. It opened their minds, according to them.

About the perception of the management improvement, the technical owner said:

> (...) We have gained some management. We can manage better. One thing leads to another and implies in an improvement ripple effect. We continue improving little by little. We improved the way the support team learns about the system and new demands.(...) we create a separate policy. (...) Okay it is missing something here yet. But to work and improve the development team allowed us to see other this as well". (PD 29:5)

In order to present those concepts, MR-MPS-SW level G was used (SOFTEX, 2012).

The culture of reliving the problems was also a tough issue in organization G. As they never stopped to analyze the problems and to reflect about it, the relived the same problems occasionally. For an example, the support demanded time, as an interior disturbance factor. They usually needed the same information, or they had the same problems. Later one some routine where implemented and videos made available to help the support to be more independent. Once tools were given, they were more independent.

The retrospective was good enough to improve the small and technical problems. In addition, some reflection took care of bigger issues. Along the work, they maintained the retrospective. Although they decided to have informal retrospectives and just one formal at the end of the project. Figure 6.19 present the network view for the perceived problem.

The observation and interviews presented an dissatisfaction with the support interference. As the represented by the statements bellow. It was from the first talk with the Java Leader programming and the Delphi programmer in the first day of the research.

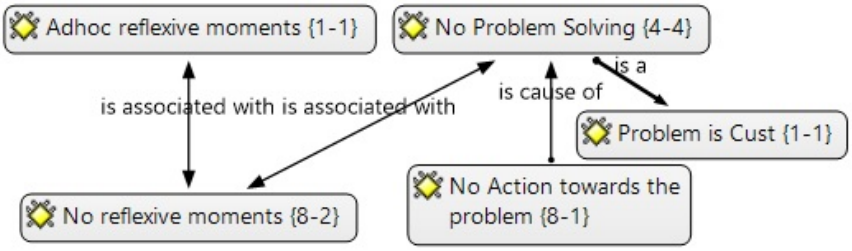


Figure 6.19: Living the Problems Network

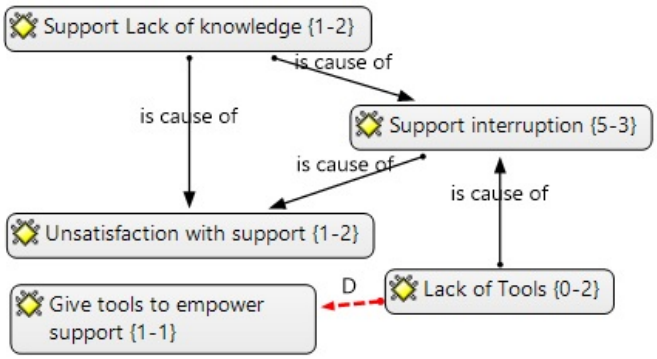


Figure 6.20: Support as an interior disturbance factor

> "Main problem: The support system knows little, little will to solve the problem and that just passes it on to the development team support Lack of initiative to learn more of the system" (PD 28:4). We lose a lot of time accessing or treating things that could be handled by the support"(PD 28:4).

Therefore, as presented in Figure 6.20, the videos and scripts as tools, besides some training every Fridays were the right actions in order to overcome partially the problem of support interruptions and interference. Some interference remains, but it is normal for their kind of business. The satisfaction and the relationship among support and developers improved.

Focusing on the estimation skills, they were unaware of the agile estimation techniques. The technical owner had recently studied it at his master course, but never had the chance to use it. The team had no estimation capacity also due to the lack of knowledge about their own productivity. Since they focused in one demand at a time, the tasks were usually long and the "guess" about when to delivery was usually imprecise. All estimation was informal.

They went from lack of visibility and capacity to estimate with the help of an agile "Relative Complexity Ruler". The planning poker did not work for them, but ruler worked fine for them, since it had examples to compare requirements or task, such as references tasks to be compared to. So following the agile suggestion, we use their knowledge and relativity to estimate. Along the process, the tasks got smaller. Figure 6.21 presents the network related to the lack of estimation knowledge. "D" represents the action executed.

Looking in a wider perspective, not only at the micro actions, the intervention helped to bring a better management, control and visibility. After some reflections, the better suitable

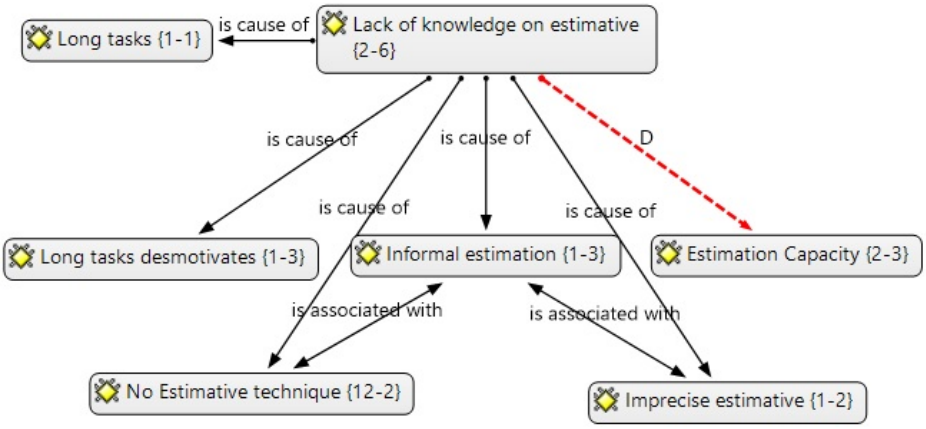


Figure 6.21: Lack of Estimation Knowledge

choice analyzed for the organization was the scrum adoption. Not only the inside control was improved but they were able to change the client culture. The client went from "cannot wait" to understand that they will get their demand in the end of the project.

There was no process or role description. The responsibilities were tacit although it were not consensus. The explicit process and role descriptions helped the visibility of responsibility and systematic. As presented by the technical owner, in the feedback section:

> "The improvement came in waterfall. Once we overcame a challenge, we could see the next, like in waves. (...) I learned something with you every time you came"(PD 29:5).

Figure 6.22 presents the network related to overall intervention.

6.8 Project Actuality Phenomenon: Organization *F*

6.8.1 Characterization and Context

Organization *F*, as we see it, is an organization that produces and maintains sites for other organizations. As they see themselves, they are an organization that helps their clients to understand its clients and to multiply their name and business. Their clients are market area in big construction companies, contractors or hospitals and others. From the overall 70% of their fix income is from construction industry.

They have over ten clients that demands new requirements for their site based on events, curses, projects, fairs and others. Those clients are project clients. Over all, there are 91 active clients. Although they lost 7 clients in the last few months.

It is located in downtown Recife, in Porto Digital. For each work to be done they need a designer that takes care of the interface, the site look and harmony. One front-end developer that prepare all site for the code and a programmer that makes the codes and everything work. As

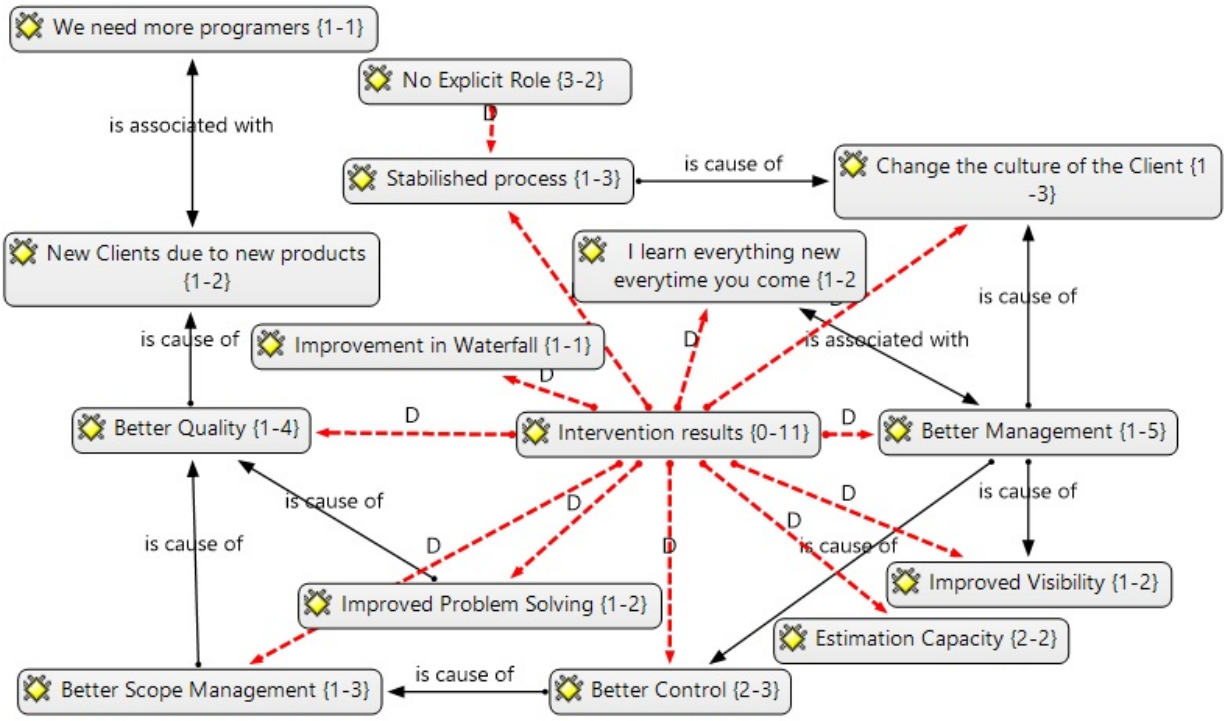


Figure 6.22: Overall intervention network

nowadays the end computer can be a smart phones, tablets, small or large tv, they must make it work with every single size and devices.

They had two teams (*F1* and *F2*) both teams had week sprints. Each team has two programmers, three front-end programmer and one designer. Although the designer used to be shared until the beginning of April. In both teams the Product owner (PO) works as manager. For team*F2*, the owner with the higher partnership majority and the president (over 90%) is the PO. The other team (*F1*) has an ex-designer as PO, and nowadays, also a partner. His team has the trainee designer. They all used html 5.0, css, Java script to perform their tasks.

They all shared the same room where parallel rows of computers divides the room in three hallways. The first hallway accommodates the four programmers in two rows, two support analysts, that answers client's first questions. They were not considered as part of the team. I also sat in the same hallway close by the extra sit that completes the row. The second hallway accommodates the six front-end programmers and the two designers. The third one is for the three administrative girls and the tester in the first row and the two product owners in the other. The hall accommodates a huge scrum board (2 meters X 3 meters). The room finishes with a small free area with four huge cushions usually used during lunch by whomever finishes first the lunch and does not want to play games. They also have a large meeting room that accommodates 10-12 sitting persons, and it had a mini fridge and a coffee machine. In addition, another little room that accommodates four at the most, also used for stand up meetings or personal meetings. The restroom was outside their room and there was no place to eat.

Both teams got along together. Six of them had over two years working together, but the

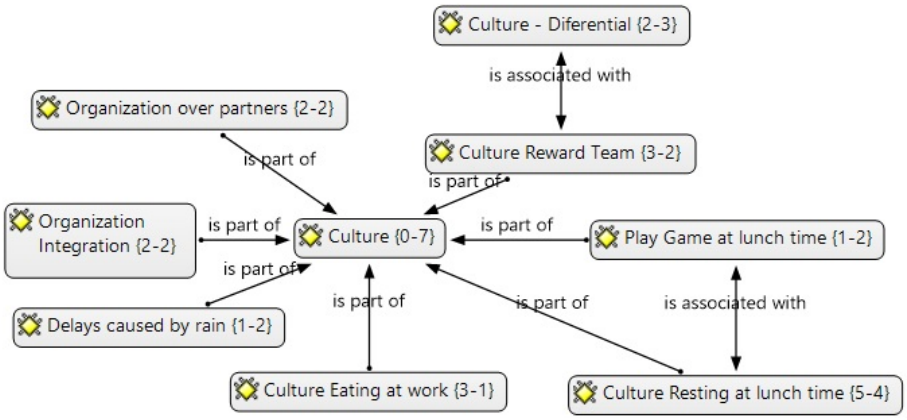


Figure 6.23: Organizational Culture

rest of them was less than a year together and in their first job (8-10 months). They worked fine together and everyone did their best. Two of them did not put the same effort and compromise into it, but the team made sure to complain about it and they began to rush to keep up with the everyone else. The productivity was not as good as it could be. However, they cooperate to get things done (the scope promised to the PO after the planning).

They had a nice organization climate. The organization's integration actions also helped that. The ones observed by this research were:

- Promoting Bike rides. These rides contemplate the family as well;
- Flowers for the woman's day;
- Pizza for every new employee as he was offering for the team;
- Payment for short distances running;
- Secrete Santa (or Chocolate if close to Easter).

They were always together, during lunch, either they were resting or they went playing at the meeting room. Part of this culture is presented in Figure 6.23. As all team members, when work by bus, often they started the day taking some food to the computer and having breakfast. Not mentioning that sprints that met all goals were rewarded with pizza as well. The two employees that were also partners got in that place out of recognition. The scrum master for *F2* was the next, according to the owner. Out of all organization, along with *D*, this organization was hard to leave and the one that the first research most felt a member.

In addition, besides the PO, everyone uses public transportation. I had the opportunity to presence two raining days and almost everyone got in over one hour late, for some of them two hours late. Whoever need the metro, once it stops (something that the rain can cause) is automatically 90 minutes late. Anyways, an issue related to getting after 8 was observed and took hours from the high management (two PO's, the senior programmer and one administrative

employee) thinking in what could be done. A usual snack break around 4-5pm was also an issue. Supposedly, they should use 10 minutes but it often took almost thirty.

Part of the team were just graduated from college (3) and the other part was still a student (2). The former scrum master was the oldest one around and had two years and four months in the beginning of the work and new scrum master had two months less. The other three had 7-8 months and seemed like much more once you saw them together. The designer got in along the work in March 20th. The PO used to be the designer of this team years ago and for the last six months had been sharing the designer with Team F2 and helping himself occasionally.

Most of the management techniques came from agile methods and although they had MR-MPS-SW (SOFTEX, 2012) maturity level F, just one team used the project concept. The focus was in the week sprint. The sprint and its requirements was planed, estimated, analyzed, agreed and committed and monitored. The old project documentation was long and repetitive. The scrum (SCHWABER, 2004) techniques were the most used to manage sprints or projects. PMBOK (PMI, 2008) was not used once or ever and it was not an reference for the teams.

An administrative employee was invited to conduct the case study and to use the approach. She had assistance, but manage to use the approach without problems. Most of the findings here presented for organization *F* has the point of view of two researchers.

6.8.2 Dimensions Analysis (F)

This section summarizes the analysis for the dimensions: organization (Table 6.32), team (Table 6.33), project (Table 6.34), and individuals (Table 6.35) for organization *F*. This section shows drivers related to the sub-question “What external and internal factors influence the project and teams”. Appendix D presents the full view of the findings on the dimensions as an example. Only the the "client presence" from the Project dimension was suppressed since it was not observed in this organization.

In the almost four months we spent there, we never observed or heard a market pressure. Such as getting prices down in order to fit for a new client or losing team members for some other organization or hushing out a new project to be the first. It was not seen as well, government pressure. As they do not deal with products that are legislated by the government. Nevertheless, the moment Brazil was going through was a problem. They were very worried about the dollar cost. Since the cloud computing demanded high level computers, and on-line services paid in dollar, their cost went up 25% during this four months. For that the govern and its lack of actions turned to be a external disturbance factor.

The ”Govern impact” is an external disturbing factor for organization *F*. Although, it is normally a much smaller impact than the one observed in the others organizations. Due to the lack of governmental actions, the organization feels the moment Brazil (”Current Brazil”) is going through. As already mentioned, the clouding services are paid in dollars, and it is charged in Reais. Since the dollar went up from R$2.65 to R$3.29 in less than three months, it affected

Table 6.32: Dimensions Analysis: Organization (F)

Factor	Analysis
Governmental Pressure	Although the govern did not pressure the business operation, it interfered with bad politics and lack of actions. Part of this phenomenon was translated in Figure 6.24. In the feedback section, it was said that due to the bad political moment that Brazil is going through there was a client loss (PD 57:12) and an lower demand for projects (PD 57:13).
Market Pressure	There was no market pressure, we got an affirmation for that and all the moments observed supported the affirmation. Only once it was commented that "In our market people do not know to position"(PD 20:9), regarding some opportunities lost for a much lower price. But they were not worried about it.
Customer Pressure	A few calls emerged during meetings. Once the programmer that is a partner said "The PO must follow the guidance we are trying to pass, not answering the phone in the meetings"(PD 53:1). If was not for the calls, the research does not present findings to consider it pressure.

their business. Besides, they were ready to change all the computers, and the two teams were stuck with old and unproductive computers, since the dollar made it impossible to change them all. This effect is exhibited in the network presented in Figure 6.24.

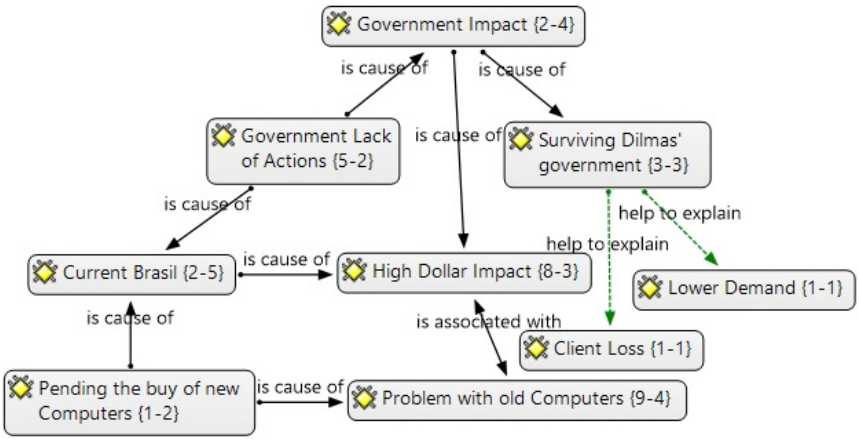


Figure 6.24: Govern as a external disturbing factor (F)

The worst impact related to the Government was the client loss and the lower demand due to the market downturn. In the begging of June 2015, an informal email was sent to the owner. In the email, we kindly asked how everything was. And the answer was: ”We are trying to survive Dilma’s Govern” (PD 59:1). Every administration meeting, hold every Monday afternoon, had several jokes about the Current state of Brazil and its president. In the last visit, in the moment to collect a last feedback, the owners said that in order to stay well they must fire two employees with less performance and commitment.

Table 6.33: Dimensions Analysis: Teams (F)

Factor	Analysis
Cohesion	*F1* was cohesive, although *F2* lack of it. For the PO *F1* was closer and the official Scrum Master (SCM), later on turned officially into SCM, was the glue to the team. They had common goals. Once one of them found something interesting, a course to attend, all front ends programmers would stick together. They did everything together along the day, working, eating and even getting a snack.
Customer Pressure	"There was some pressure over the team *F1*, and it was seen in the indicators week after week, since they were always doing unplanned items. Data from every week showed the scope changing. *F2* suffers less only with a feel phone call though the PO."
Leadership	Both team had good leaders. Although *F1* had a strong influence on the team.
Owner Interventions	The pressure was mostly on the designer by the PO from F1. Although, the PO's lack of time generated lack of backlog and tasks, as presented in Figure 6.26

Some aspects about team's cohesion and leadership for team *F1* is presented in Figure 6.25.

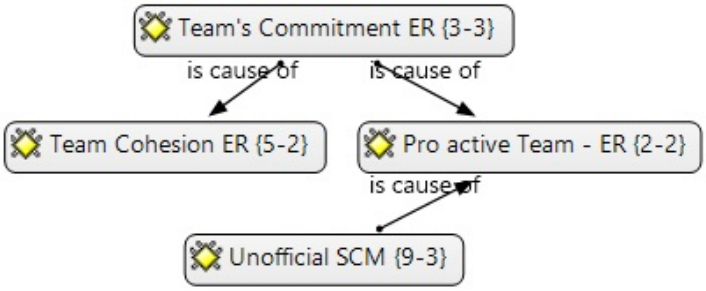


Figure 6.25: Team F1 cohesion and leadership.

The PO's are also the ones doing the selling. They had weekly meeting with clients that had ongoing project, and still had to look after active clients (91) that had the right to Site maintenance. These meetings, generated backlog for the teams related to those projects. In addition, the future projects must be idealized, sold and new clients visited. As already mentioned, the PO for F1 was the majority owner with 90% of the organization. He had the busiest team and the bigger number of clients, besides all the financial work.

As presented in Figure 6.26, the owner's busy agenda lead to an interior disturbing factor, the PO's lack of time, presented as manager lack of time. The owner's activities and the centralization was one of the causes for this disturbance. In addition, the lack of time generated lack of backlog and work to his team. Although, the backlog for F1 was the longest one, and the

lack of work seems to be impossible, this phenomenon was seen in three weeks, closer to the beginning of the research.

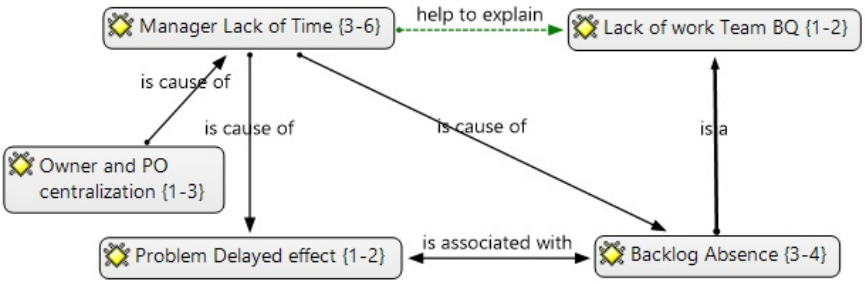


Figure 6.26: Interior disturbance factor, PO's lack of time

The PO's lack of time caused immediate lack of prioritized tasks to the next sprint. Besides, if for a trimester the "Selling" was not prioritized, it generated lack of work months later, as this effect was not felt immediately. The organization called as "retarded effect". This kind of problems could not be compensated. A week lost, was a week lost. The reflections did not manage to think about great ways to overcome this problem. The actions were more to decentralize the organizations management and to optimize their time. The first action was to establish an organizational scrum master. She helped with some operational tasks, and organizational management. This management end up been migrated to Trello[7], and was a success. With a quick training, she was already organizing everything on Trello. Once she got part of the tasks, the PO-owner had gained a couple of hours a week. With the waste elimination on meetings and indicators analysis, another couple of hours were gained on Fridays to both PO's.

Table 6.34: Dimensions Analysis: Project (F)

Factor	**Analysis**
Management Pressure	The pressure was mostly on the designer by the PO from F1. We have only to entrances, but this was also seen in the meetings.
Client Presence	Not seen
PM Effectiveness	There were many practices been carried with effectiveness. The PMBOK (PMI, 2008) and MR-MPS-SW (SOFTEX, 2012) adherence presents it. Just a feels quotations were chosen to point maturity manager.

[7]Kanban based free tool, available at https://trello.com

Table 6.35: Dimensions Analysis: Individuals (F)

Factor	Analysis
Motivation	The organization paid for courses that only team *F1* was doing. And those courses motivated the team. Commitment was seen as a motivation reaction.
Outside life Interventions	The tester was a musician and was getting late due to that. Besides the *F1*'s PO had an old father that was needing him with frequency. All entrances are related to the test getting late on Fridays. Usually interfering with Team *F2* agenda. The
Additional Responsibility	The programmer that was also a partner had activities related to configuration management for both teams. These activities occasionally generated some impact on his team.
Proactivity	The proactive was seen in the beginning only by *F1*. Although it was strong in *F2* after the intervention. Once we reflect about what should be done, references and theories, the scrum master would come out with an example or would start immediately the actions.

6.8.3 Adherence to MR-MPS-SW

Even if the organization *F* has been assessed MR-MPS-SW (SOFTEX, 2012) level F in 2014, some practices and expected results stop being used or elaborated since then. Team *F1* still elaborates the project plan. Although, most of the time the schedule was not updated, or in the last month, not even elaborated. If the analysis focused only on the sprint (a week long), almost everything would be fully implemented, but as the full project had to considered, their performance was not so well. Risks were identified but lack of monitoring and control. Problems were identified poorly, in the end of the sprint, considering the past week, although no action plan was traced.

Team *F2* did not use project plan. Once again, focusing only on the sprint, all requirement and tasks were estimated, planned, monitored (also with the help of indicators) and analyzed. Some results were considered partially adherent, since some planning was done in the Redmine and it was updated. Most of the management focused only in the sprint, not on the project. No risk or problem was managed during observations. When asked about the project plan, the PO said:

> "The schedules does not add any value to our work or its monitoring. We did it only for the certification. Is too much work unnecessary. And the plan is too long and I do not know if it really helps"(PD 44:1).

The preliminary adherence summary to the *Project Management Process* from MR-MPS-SW (SOFTEX, 2012) is exhibited in Figure 6.27.

	Expected Results	F1	F2
GPR 1	Scope Definition	L	L
GPR 2	Products and task estimation	T	T
GPR 3	Life Cycle definition	T	T
GPR 4	Effort and cust estimation	P	P
GPR 5	Schedule, milestones and budget definition and maintenence	P	T
GPR 6	Risk Identification	P	P
GPR 7	Human Resources and knowledge definition	T	T
GPR 8	Other resources definition	T	T
GPR 9	Project data identification	T	T
GPR 10	Stabilish a Plan	P	T
GPR 11	Project viability analysis	P	P
GPR 12	Project Plan revision	L	N
GPR 13	Project Parameters Monitoring (Scope, schedule, cust and estimatives)	L	L
GPR 14	Project Parameters Monitoring (Human and non human resources and data)	T	T
GPR 15	Risk Monitoring	P	N
GPR 16	Stakeholder envolviment Plan and monitoring	T	T
GPR 17	Milstones review execution	T	T
GPR 18	Problem identification and analysis	L	P
GPR 19	Action response	P	N

Figure 6.27: Initial Adherence to MR-MPS-SW Project Management Process (F)

6.8.4 PMBOK Analysis

The adherence to PMBOK (PMI, 2008) was hard to analyze, since there is so many processes and components for each area. As already mentioned we focused in a few components and processes in order to analyze the compliance.

As already explained, the lack of project planning was the worst enemy for the compliance. If the analysis was on the process it self the result would be different. Since the process had several PMBOK's components, but it was not considered since it was not fully used.

There was no schedule or WBS. Requirements were identified, collected, defined and monitored. Although, the scope was defined for one or more sprints, and controlled every week formally, there was no focus on a project was done. All changes were controlled, but once again the goal was the sprint. Beside the fact that the sprint had 5 days, no other time was set. There was a estimation based on complexity, but there was no duration's estimation. In the begging of the sprint, the team compromised with the PO in how much tasks they could get, without worrying with the duration of the task.

A budget was given for each project, but there was no monitoring. What matter was if the fix cost was paid or mostly paid by the fixed income. They were the most aware and mature organization of them all, concerning to costs. Even though the project cost was not controlled ,

Table 6.36: Adherence to PMBOK (F)

Knowledge Areas:	**F1**				**F2**			
Project * Management	**In**	**P**	**E**	**C**	**In**	**P**	**E**	**C**
Integration	1	1	1	1	0	0	1	1
Scope	X	2	X	1	X	1	X	1
Time	X	0	X	0	X	0	X	0
Cost	X	0	X	1	X	0	X	1
Quality	X	0	0	0	X	0	0	0
Human Resources	X	2	2	X	X	2	2	X
Communications	X	2	2	2	X	1	2	2
Risk	X	1	X	0	X	0	X	0
Stakeholders	1	2	2	2	1	2	2	2

or the sprint cost, they had control of the monthly operation cost.

As the team was always the same, and it was established in tools and minutes in the beginning of each week, we considered the human resources were established. The summary for that adherence is in Table 6.36.

6.8.5 Research challenges in Organization *F*

During the first two and a half months the biggest challenge was to keep the second researcher from precipitating and start acting. Beside this challenge, no other was found. The comparison of the data also introduced another day for data analysis. Organization *F* also gave us a fixed place to sit and took us as team mates. It was easy to blend as similar and to gain trust. Once the reflections started everything got even better. It was the hardest organization to leave.

6.9 Project Actuality and The Action Research in Organization F

In the Organization *F* daily routine, another common interior disturbance factor was the lack of test capacity. *F1*'s sprint ended Thursday night and had the review, retrospective and the beginning of the nest sprint Friday morning. *F2* ended Friday at noon and had the ceremonies Friday afternoon. As they shared the only tester in the organization, usually they had a bottleneck in the end of the sprint, due to the concurrent sprints. Besides, the tester was overwhelmed with many demands on the last sprint hours. He went crazy from Thursday to Friday and usually missed part of the meeting due to the late tests. From Monday to the beginning of Wednesday, every observed time, the tester had lower demand and Lack of work. As they did not plan partial testes, usually the tester could not delivery to *F2* what he supposed to. The network presented in Figure 6.28 explains this disturbance interior factor.

The tester was also a musician and every Friday, although the organization and his teams

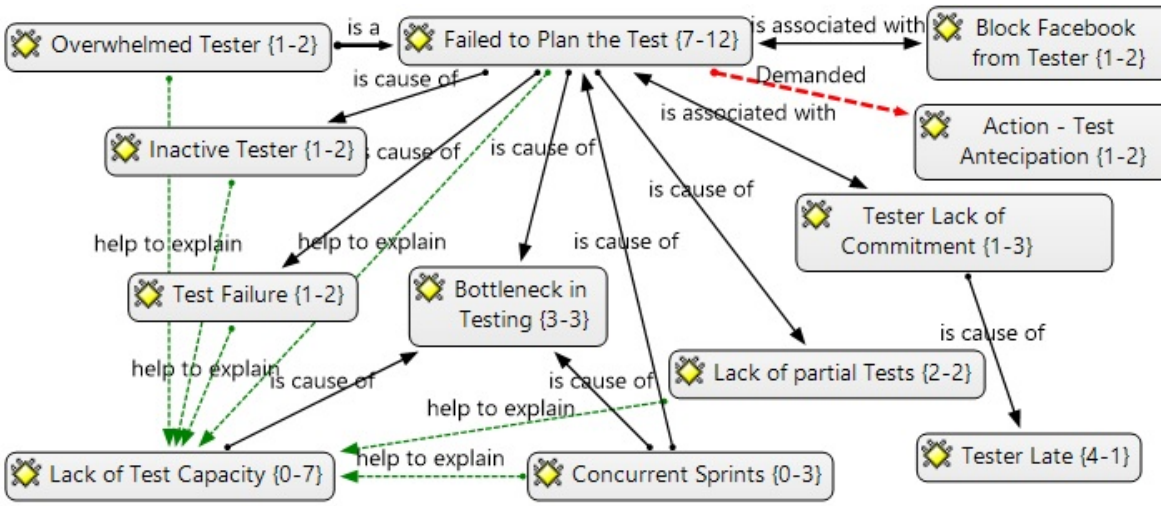


Figure 6.28: Interior disturbance factor, Lack of Test Capacity

needed him the most, he got in around 9:30am. So 1,5 hours after everyone else. He also presented lack of commitment, once in an attempt to speed his test, the organization cut down his Facebook access. We did suggest changing the ending days of the sprint, but the POs did not want to change their agenda with their clients. The only thing that did work, to treat this lack of capacity and the systematic failure to plan better the tests, was to force the team to break the activities in smaller ones in order to be able to anticipate the test. Moreover, teammates that had ended their work started to help the tester. The smaller size of the story and the anticipation, were well taken and a success action.

The biggest problem of them all was the unproductive meetings. Since they had week sprints, 2 hours of waste every week of every team member was a huge waste. The meeting were divided in two parts. The first two hours was to analyze and review the sprint results, and to do the retrospective. In addition, the second part was to start and plan the new sprint. The first problem was that we always had everyone inside the room waiting for the meeting to start and the two TV and computer were never ready. Since the first objective was to present stories, cellular, tablet and computers supposed to be ready to present the ”done stories”. In addition, some times the tester was ending his activities and some activities were not in the status to be presented. Moreover, sometimes the link to exhibit the story was not available to help that moment. This lack of readiness took at least fifteen minutes from the entire team. This phenomenon was documented in the network presented in Figure 6.29.

Besides, the cellular phones were an enemy; everyone had its own life a part from the meetings. In the reflection, the team’s immaturity and young profile came out from being one of the problems. Most of the programmers were in their first work and with less the 1,5 years at the organization.

Along these first two hours, the PO was presented to the stories. For *F1*, the analysis started on the day before, and everything he could, he approved before the meeting. Therefore,

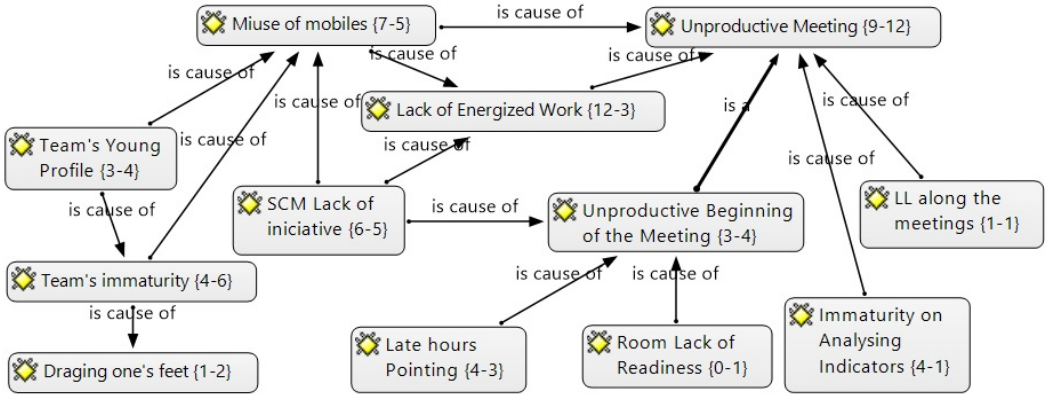


Figure 6.29: Unproductive Meetings

after it was presented the stories, they went to their places analyze the following indicators:

- Hours planned X hours executed.
- The number of story point planned X executed (Velocity).
- Scope variability.
- Number of escaped bugs (Escaped bugs).

Moreover, the indicators were analyzed by sprints and not by projects. The focus strict to the sprint was overcame along the action research.

Most of the time the team decided to point the week hours in that moment. This late task, beside the problem itself for the data, took time from everyone. Moreover, it took time from the PO. After the indicators analyzes, everyone went back to the meeting room to analyze together and to do the retrospective. Usually this time took by itself almost a full hour. The team was too young and immature to analyze the indicators, most of the times the analysis just did not meant anything for anybody. There was not an action to overcome a problem neither an action to repeat a success. No results once or ever, came out from this analysis. A consultant told them to analyze those indicators as a group and they kept on doing without questioning its reason or utility. It was a more mechanic act then an analytic one.

Once the indicators were analyzed and the analysis documented, the retrospective took place. The retrospective was also mechanic and they stop to think about it along the meeting. Team *F1* did not reviewed last meetings observations, and rarely demanded actions. Team *F2* also had a mechanic and unproductive Lessons Learned (LL). However, within the first reflection, team *F2* took notes to perceived recurring problems. It turned into a checklist. Part of the checklist they started to analyzed was *IF*:

- It was applied mobile redirection to the stories;
- It was used Grid template for the responsive sites development;

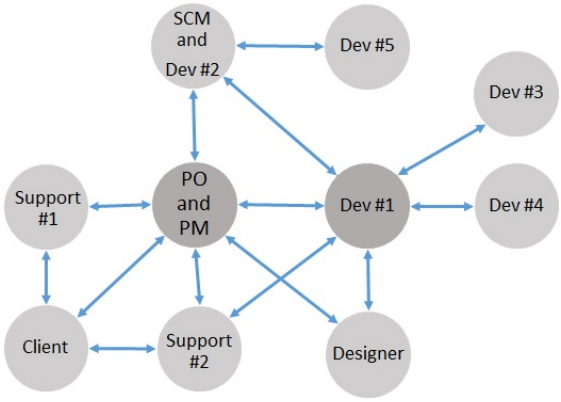


Figure 6.30: Communication Map for F1

- It was used the links customization independent of the folders;
- Daily meeting was occurring at 14:00;
- Very extensive tasks were broken;
- The stories links was available for PO's testing and review;
- The check List was been analyzed prior to review meeting (Is it everything really done?);
- All forms were validated in the server.

All action came from our rethinking and reflections.

Another problem was that the SCM where not acting in the non-energized meeting. Teams *F1'* SCM did not have a profile to be as scrum master. In all the recordings, his voice was the one never listened. The communication flow showed that everyone in the team looked for another programmer (Dev#1) for help or similar. As seen on Figure 6.30. The PO managed the meeting with the help of a Front End programmer. Later on, as an intervention action, this programmer assumed the role of SCM and this was a great difference in meetings' focus and productivity. *F2* Scrum master also had to be motivated to act in a different way, and without a doubt was the most enthusiast of all the actions and research among the team members.

It was tough to stay awaken, since all the planning poker was done with little engagement and lack of scrum master action. Sometimes in the middle of the meeting those who did not use the mobile application to establish the complexity, ran to get the cards. Someone always needed to go and get the cards. The cards were made and given by the organizations. Usually those who had less conviction of the complexity, looked and followed the others. Even though they had three kind of tasks (designer, front end and back end) everyone voted. The problem there was the technique's misuse. In some cases, they associated complexity with hours necessary to execute something.

Besides Scrum Master substitution for *F1*, and talk to both of scrum masters, many changed occurred to overcome this actuality. The most relevant one was to improve the indicators and to separate those analyzed by the team every sprint from those analyzed by the organization and brought to the team every project (4-5 sprints). Some other actions where:

- The organizational scrum master monitored the hours and brought to the team only when something were wrong, in the retrospective. The idea was to present formally the indicator at the end of the project.
- A mini training was given to everyone to point out the importance of the organizational knowledge on how many hours everyone actually worked and how many hours took to produce a Story point.
- Two indicators were unified and presented in just one graph. It was possible to see scope variation and story points planned X delivered. That began to be the only indicator analyzed every sprint. Moreover, it was analyzed by everyone together without getting out of the room.
- The lessons learned was now on the *googledocs*. Everyone should include their lessons along the week, not in the meetings. You could also vote in someone else's topic.
- The bugs' indicator was analyzed by the tester and scrum master. They brought to the meeting only in the end of the project or if something very wrong was going on. The organizational scrum master also participated of that moment.
- Different members, to boost the meeting, read the stories. Replacing the old way of just one person reading.
- In order to facilitate the review, every story must had a link to the PO easy access.
- The scrum master organized the room for just afterward, call everyone in.

For the first five observation weeks, the *F2* meeting did not end before 18:00 and the negotiation (If more stories that the team could handle in the sprint, they had to negotiate with the PO to see what would be left outside of the sprint) was left to Monday morning. After the intervention the entire meeting (review, retrospective and planning) ended around 16:15. After 135 minutes. With those actions, the entire team got 2 extra hours for the sprint and the PO to plan ahead.

Besides this scenarios, two other matters for this work. The actuality of each team and its problems and strengths. Even though many problems hunted team *F1*, they were a cohesive and committed team. The scrum master substitute arose naturally, as he was already the leader. We could listen to his voice helping, and cheering the team up. Always looking one to another. With

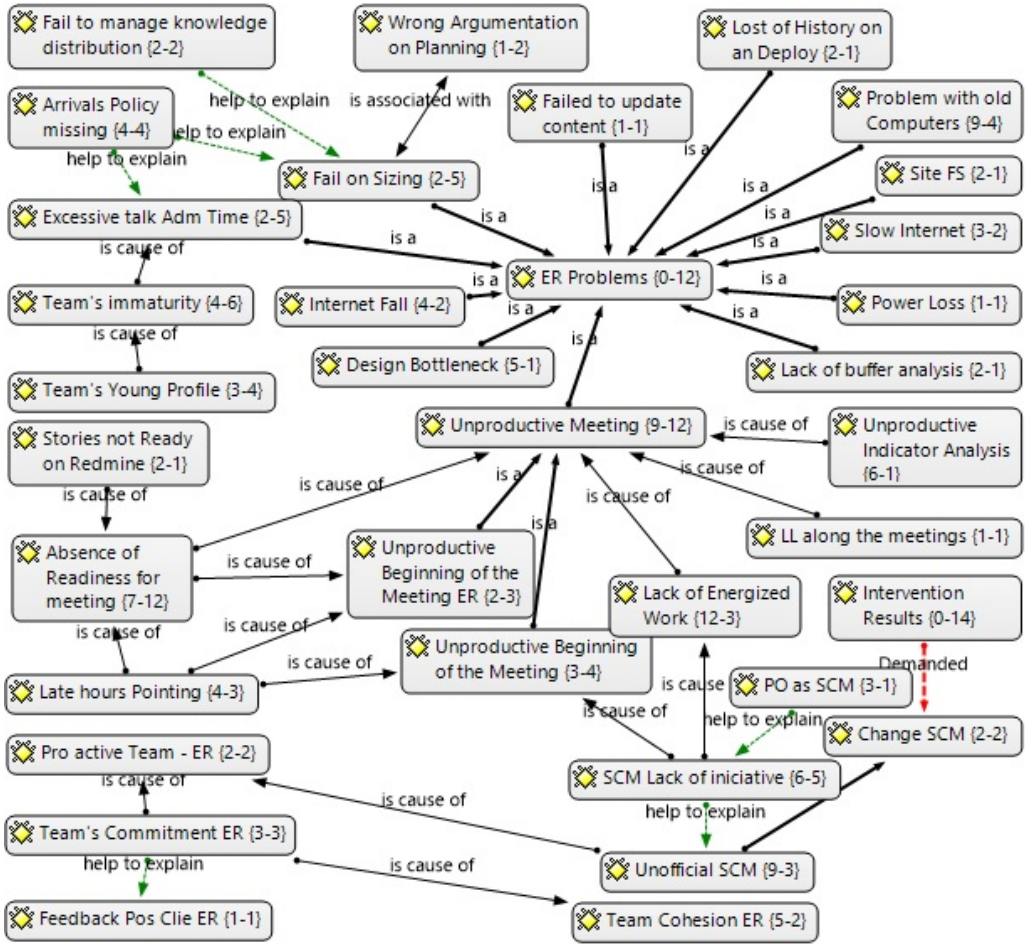


Figure 6.31: F1 team's Actuality

a little help, they got even motivated with less "boring long hours" inside a meeting. Three of them was having classes in a technology used in their work related to Sites. Every accomplished one of them had, they shared among each other and even asked to share with the other team. Figures 6.31 and 6.32, represent teams' actuality.

Unfortunately, the former scrum master fired himself in the middle of May. Maybe that was a justification for the apathy observed. Although he said it was for money, it concerned me that he did not want to lose his position and felt decreased when lost the scrum master role.

The team will be better once the moment that Brazil is going on get a little better and they get new machines. The ones they have are old and presents problems seem many times along the work. The new scrum master also had a scrum master training and it hopefully will improve his skills on sizing with agile techniques. I did not steak enough to check the result of this action.

The future team member, that will probably arrive in the next weeks will also be introduced to the Internal Policy and Rules. That will help them understand what the organization wants. They still have to improve the productivity during early mornings, the talk with the three girls from the administrative team can be seen as a waste of time.

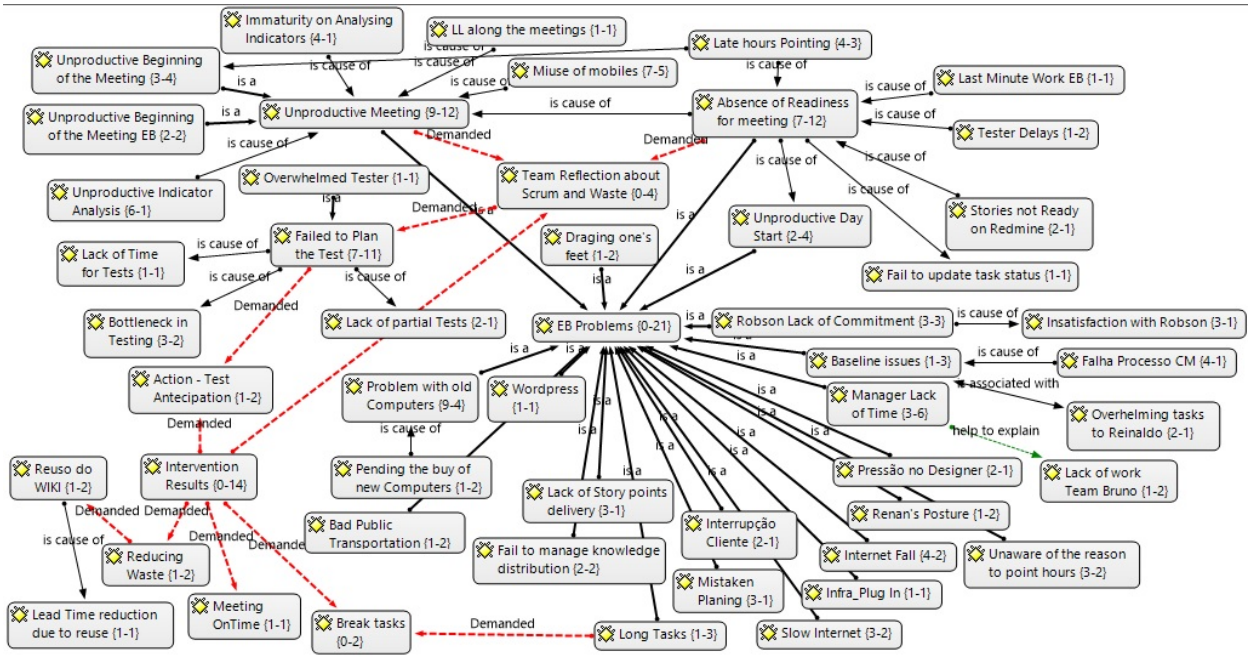


Figure 6.32: F2 team's Actuality

The retrospective and reflections are working better and is helping the problems to be solved, such as lost of history on the deploy, the problem to update the content. The organization is treating the Internet problem with some politics. However, it will still be a problem, since the infrastructure is not the best. As the business is always on-line, this is a huge concern. Team *F2*, had more problems to be ready for the meetings, such as tester not ready, Redmine not ready, and the programmer that was also the configuration manager were always doing the baselines or waiting for the tester to end his work. During reflections, they decided that whatever was not tested and ready up to 1pm, would not be analyzed and the PO would reject it. That was to guarantee the better management of everyone else's time. As already mentioned, the partial testes and the help from other team members also reduced this disturbance effect.

The project documentation was revised. It was created an organizational project plan with most of the static information, such as: life cycle, monitoring and control agenda (meetings, results, stakeholders involved), communication process (all communication events, target, moment, responsible, stakeholders and results), configuration management planning, quality management planning and triggers, and also a macro schedule. Moreover, each project got a lighter plan that complemented the Organizational Project Plan. The indicators in its new version focused on the project and its analysis happened in the end of the project.

The team also faced problems with old computers. The communication was not as strong as in *F1* and we did not see among team members the same cohesion. With *F2* we had several talks about how to evolve the configuration management and how to let it less heavy. We also talked about IPMA (ASSOCIATION et al., 2006), scrum and Lean a lot. Those were the main references chosen to produce reflection. We manage to break tasks in smaller tasks, regain the

rhythm in the meetings. The standup meeting were fundamental to plan and monitor test status and improve team communication.

Also in F2, a front-end programmer wanted to be a doctor. In order to accomplish that, he started a course changing his getting in time to adjust to his personal demand. Although that was not a problem, the team saw a lack of commitment. Team and owner got unsatisfied with him. We have recorded that the scrum master verbalized that if he did not engage in the team spirit would be better to replace him. Nevertheless, the owner verbalized that he was slowing the team down. During June his is on vacation, and according to the owner, he will probably lose his work when his back. He worked for organization F for 2 years and 9 months in the beginning of the work.

The scrum master has almost four years with them, and the programmer that is also a partner for almost fifteen years (14 years and 8 months). The designer was around for 2,5 year. The other programmer for almost two years and the front end programmer that sometimes presented lack of commitment 8 months. The team was by far more senior then *F1*, and able to deliver much more. Although the lack of experience and knowledge, was compensated by cohesion and commitment.

Finally, we must say that *F2* scrum master and the young programmer (with less than two years working for them) were by far the most committed with sprint and project success. They were productive and engaged every day no matter what. Even in the raining days, when the public transportation collapsed, they manage to get in focused and go strait to work!

6.10 Closing Remarks

In all studies, we used the approach built to provide a framework for analyze, study and understand the organizational and team culture, and for uncovering the knowledge, ideas, beliefs and values surrounding project management actuality. By analyzing the discourse and tags, people's interactions and attitudes, we explored the organization, team and project actuality. Case studies where used to refine the approach and also to validate it and to help the understanding the phenomenon. The studies ended up with action research to change the scenario observed and analyzed.

Although some difficulties were found, this approach was easy to carry on and it manage to bring its findings on the actuality of the small development organization. Our sample shows that most of the organizations has one or more products and some times, hundreds of clients. For the entire sample, we can affirm that it was not common to come across project oriented organizations. All six organizations are more than 10 years old, with a few or a dozen or even hundreds of faithful clients. A lot of them have developers with at least three years as an employee.

The overall management has a lot of practices suggested by agile methods (SCHWABER, 2004). To most of them, to define software development operational work as projects was one

of the first interventions agreed by researchers in action. We also found out that bodies of knowledge are known, but not used in this kind of organizations. Risk is a far distant discipline, definitely not a reality long with problem analysis. On the other hand, test is present in almost all organization in the sample. Agile practices are used but not integrally, the simple idea of reflecting and learning every cycle is rarely used. The owner, sometimes, has a centralized unhealthy involvement in the team. However, by far, the government is the biggest villain on this scenario, as it was always demanding new regulatory requirements without clear documentation or client support. Even though the taxation agent on the government was the biggest villain for most organizations on the sample, the absence of action by national govern face the 2015 problems were also a struggle for organization Even for the organization *D*.

The amount of data collected during qualitative research is overwhelming. In addition, indeed qualitative research methods are time consuming and the social challenges dealt by researchers in software engineering investigations make time an important constant in the possibility of obtaining relevant results. For every hour at the research field, at least another two hours are spent afterwords analyzing it. Altogether, there were over a six hundred hours used to understand project actuality in the field, regardless the extra hours processing the collected data and analyzing. For that Atlas.Ti was a great help to organize the ideas.

Time dispensed on transit was also an enemy. Every day in the field corresponded from 90 to 150 minutes moving to/from the research field.

The limitations is the same of any qualitative research, as culture is always evolving; the findings are context and time dependent. Besides, unfortunately, there was only one researcher and it was not possible to compare notes and observations. Nevertheless, pre-reports, graphics, and resumes were presented to the participants to confirm its understanding and adjust the findings.

7

Results Analysis

Make no mistake, you can only achieve simplicity through hard work.
- Clarice Lispector

The previous chapter was dedicated to describe in detail the project actuality phenomenon identified by executing the approach. All the findings consider the analysis drivers and the established propositions.

This chapter is focused on presenting the consolidated results and analysis, a clearer understanding of project actuality phenomena, common problems and common actions that emerged from the intervention. Noting that those findings are context dependent. We are not trying to generalize all small software development organizations, but to compare some findings after reading about project actuality in each organization. Moreover a critical reflection is discussed regarding the approach execution and its findings. In addition, this chapter is dedicated to revise each proposition in order to go deeper on project actuality findings considering the combined results and analysis and the theoretical referential used along the research. The propositions are presented and analyzed grouped by research question.

7.1 Consolidated Results and Analysis

The consolidated results considers:

- The dimensions (organizational, team, project and individual) and highlights the common disturbing factors. It is important to remember that these factor emerged from along the case studies by executing the approach.
- The technical aspects related to the phenomenon.
- The project capability analyzed by the adherence of PMBOK (INSTITUTE, 2013) and MR-MPS-SW (SOFTEX, 2012).

7.1.1 Dimensions Analysis

The collective view of the dimensions and its factors are presented in Figure 7.1 and similarities are commented along this section.

Dimensions and its Factors		Organizations							
		A	B1	B2	C	D	E	F1	F2
Organi-zation	Governamental Pressure/ Impact	2	2	2	1	2	2	1	1
	Market Pressure	1	1	0	1	1	1	0	0
	Customer Pressure	2	2	1	1	2	1	0	0
Team	Cohesion	0	1	2	2	0	1	2	0
	Customer Pressure	2	1	0	1	2	0	2	1
	Leadership	0	2	2	1	1	1	2	1
	Owner-others Interventions	2	2	1	1	2	0	0	0
Project	Management Pressure	2	2	0	0	2	0	0	1
	Client Presence	2	0	0	0	1	0	0	0
	Effectiveness Project Management	0	1	1	2	0	0	1	1
Indivi-duals	Individual Motivation	0	1	2	2	0	1	2	1
	Outside life Interventions	1	2	0	0	1	1	2	2
	Additional Responsibility	2	2	0	2	2	0	0	1
	Proactivity	1	2	1	2	1	1	2	1

Figure 7.1: Dimensions and Factors

About the Organizational dimension, considering our sample, we have concluded that:

- Governmental rules, laws and changes were the worst outside pressure. This factor was present, impacting all software organizations and their strategic and tactic plannings. In memos from meeting, coffee breaks conversations and other, we have several statements like:
    - "Once we change something, we already have something new to add", from *A* findings;
    - "The government hazes us" (from the Portuguese "o governo judia da gente"), from *D* findings (PD 43:9);
    - "Government always comes up with new demands and *wall-dates*" (from the Portuguese "data-parede" a due date that won't change);
    - "Our worst enemy is the government's treasury, because it generates monthly demand for us that overloads us.", from E findings (PD 13:11).
- Market pressure did not seem to be the biggest enemy. Although it defined a lot of actions for organization `B`, once dealing with the product taken cared by `B-1`

(newer product). Usually when the pressure comes, it is not from competitors, but from government or clients. Organization C wanted to get in governmental bidding opportunity, and the pressure was not on the team, but in the organization, their processes, to get certifications and others.

- Considering the customer's pressure to the organization, for those who have consolidated few bigger clients (organizations A, B) it is a huge deal. They will turn everything upside down, and they will put project, goals, new products, everything on hold, due to customer pressure.

Considering team dimension, it stands out:

- As there was not a common goal, or sometimes project concept was not present, everyone worked for his own sake and team cohesion did not exist in most cases. Among those that arranged themselves as projects (B, C and *F1*) just teams B−2, C and *F1* had the team spirit and cohesion. B−2 was the strongest in cohesion, they were like a family. The lack of common goal was the biggest enemy towards cohesion.

- Customer was also a disturbing factor. In organization A we frequently saw them getting inside the team's working room, pressuring the owner and higher management. For B−1, the team that dealt with the newer product in organization B, often changed the goal, and often rushed to release a version, for the clients sake. In organization D, for some reason some clients had some programmer cellular phone numbers, so they could disturb the team even at home. Internal or external clients are always an disturbance factor. Almost all organizations had a support team representing many clients. In that case the support was seen as inside clients and as a disturbing factor.

- The leader profile was rare. We saw true leadership from the oldest employees in organization D, and from the owner in E. From B came the two leaders (scrum masters) that were set to be leaders by the upper management that really represent the team, even though B−1 leader's lack of management skills. *F1* also had a important leader, a programmer that took over the scrum master role. The leadership helped problems related to cohesion, lack of engagement and commitment.

- The owners or leaders that were less technical, even though they originally had a computer science degree, had the worst intervention pressure on the team. Part of the turnover observed was due to these factors unhealthy pressure. The team usually tended to drop whatever they were doing in order to attend owners or leaders demands, disregarding their due dates. The owner was a disturbing factor for organizations *A, B* and *D*. The product manager from *E* was a great leader and his intervention was positive for the team. Once again the lack of leadership leads to centralization and constant interventions, worsened by unclear goals.

From project dimension, stands out that:

- Whenever the owner is pressured, the management is pressured as well. Not to mention, when owner and manager are the same person. Like in organization A, the owner's absence due to business or vacation trips, turned the operation into a mess, since everyone was used to being told what to do. The same happened with D in the beginning of our work. Both organizations had the worst scenario. Since MSE usually have a flat managerial structure, it is common to see the owner as the manager and for that the pressures that comes to the organization goes straight to the team. When this leader is more technical, this is mitigated as seen in *E* and *F*.

- Only *A* had a really present client. Whenever client is present, the information flows better among the team. But it demands a greater leader present and knowledge, to prevent from turning it into pressure. Once you have products in over 100 clients, it is rare. But somehow in organization E, the owner was also the representation of the client. In this sample, the most common situation was having an absent client.

- It is hard to consider effective the management of any organization that is not arranged as project. The project manager's role was only truly present in organization C. This aspect is also analyzed along the next sections. The organizations in the sample did mostly maintenance. For that the project turned into a temporal cut in this operation. Form two week to 9 weeks long.

The individuals dimension, was the hardest one to analyze. It was really complicated and it generates a great amount of data. But the idea was to understand how individuals necessity and life outside of work interferes, in a good or bad way, the project or the team or the results. In resume:

- B−2 seems to be the more cohesive team and the individual motivation showed good effect in the entire team and its results. The same in organization C and *F1*. They motivated one another, from individual motivation to team motivation. Once again when we had good leaders, we had more motivated individuals.

- About private life interventions, in team B−1, the leader got married. Before and after his private life interfered and impacted the dates, outcomes and project results. Even though it was planned, the organization and team was not ready for his absence. In organization A and E the leader programmer had a baby and that fact also interfered with the outcomes. Although, the conversation and the testimony showed that it was worst for organization A. In organization E, the owner was a professor, and he was also in a post graduate program, and his time was really limited, but he managed to carry on and manage his activities without a greater interference in the team's outcome. *F1* and *F2* also presented outside life that took a great hit on its teams.

- When team member has also additional responsibility out side the team, it ruins all planning. Implantation and support (A, B−1, D) was the great villain. It is common to have more than one activity on MSE. Additional responsibilities inside the team, such as scrum masters that develops (both teams from *B* and *F*) is common and they have to learn how to deal with it. C had a multi-functional team member and she dealt pretty well about it. She was responsible for web-design activities, test activities and also quality assurance activities.

- Proactivity could be seen in all organization in different levels. This behavior was really a project change in several occasions. Strongly seen in B−1, C and *F1*. *F2* had a proactive scrum master but without the tools to lead his team. Leader's proactivity, with lack of management skill does not influence teams results. Team member proactivity is good and important in small organization, but as essential as Leader's proactivity.

We concluded that for MSE it is hard to contingency leaders' absence. They are usually fundamental and without them we have lower productivity or even an operational stop (*A, B1, D* and *F1*). Also that on only motivated leader can make a huge difference in the motivation of the group. Moreover, the leadership roles are better executed when distributed and delegated, mitigating the absence problem and team's dependence. At last, in MSE in the sample, leader's proactivity without project management skills can not make great deference on the results.

7.1.2 PMBOK Adherence

This section presents the overall view that answered the question "Is PMBOK really used among software practitioners in small development organizations?". In order to present the data, we suppressed these three organizations from Figure 7.2. Organization E that had zeros for everything, D had 1 for planning and implementing the Project Scope Management.

Knowledge Areas: * Management	Organization																							
	A				B-1				B-2				C				F1				F2			
	In	P	E	C	In	P	E	C	In	P	E	C	In	P	E	C	In	P	E	C	In	P	E	C
Integration	0	0	0	0	1	1	1	0	1	1	1	0	2	2	1	1	1	1	1	1	0	0	1	1
Scope	X	1	X	0	X	1	X	0	X	1	X	1	X	2	X	1	X	2	X	1	X	1	X	1
Time	X	0	X	1	X	1	X	1	X	1	X	1	X	2	X	1	X	0	X	0	X	0	X	0
Cost	X	1	X	0	X	1	X	0	X	1	X	0	X	1	X	0	X	0	X	1	X	0	X	1
Quality	X	0	0	0	X	0	0	0	X	0	0	0	X	0	0	0	X	0	0	0	X	0	0	0
Human Resources	X	0	0	X	X	1	0	X	X	1	0	X	X	2	1	X	X	2	2	X	X	2	2	X
Communications	X	0	0	1	X	1	1	0	X	1	1	0	X	2	2	2	X	2	2	2	X	1	2	2
Risk	X	0	X	0	X	1	X	0	X	1	X	0	X	1	X	0	X	1	X	0	X	0	X	0
Stakeholders	0	1	0	0	1	1	0	0	1	1	0	0	2	2	1	2	1	2	2	2	1	2	2	2

Figure 7.2: PMBOK Adherence

PMBOK (INSTITUTE, 2013) is not used in these organizations. It was not even an reference for them. In all organization there was at least one person that knew about the reference, but no one believed that it was suitable for MSE context.The organization seems to struggle with establishing the budget and managing the real cost of a project. Managing cost was the worst knowledge area among the traditional aspects of project management (scope, time and cost). Risk is a unknown discipline. Those who identify do not really uses it to the project benefit. Is more a mechanic activity with no use at all. Quality is only represented by test activities. It is very poorly executed, but all organization has some kind of test, although they are not always planned. At last, we remove the closing processes from analysis, since only *C* had any project lessons learned or other activities related to project closure.

Over all, management seems to works with crocodile instincts, “First, survival. Then, social relationships. Finally, problem solving” (KLAFF, 2011). They all focus on scope and time, after that taking care of their clients. All organization in sample had at least one employee as support analyst, in order to take care of clients first needs and contact. As they were always trying to survive, problem solving was never done.

Other aspects were also observed on the sample analyzed. The Figure 7.3 presents some disciplines, aspects or activities also perceived along the research. In this case, only the absence (-) or presence (v) was pointed out, for planning and execution. Some of these activities are related to PMBOK (INSTITUTE, 2013) such as test and quality management knowledge area, reflection and the closing process group.

Techniques / Disciplines / Activities	Organizations													
	A		B - 1		B - 2		C		D		E		F	
	P	E	P	E	P	E	P	E	P	E	P	E	P	E
Problem Solving	—	—	—	—	—	—	—	—	—	—	—	—	√	—
Est. Techniques	—	—	√	—	√	√	√	√	—	—	—	—	√	√
Plan Tests	—	—	√	—	√	√	√	√	—	—	—	—	—	—
Execute Test	—	√	√	—	√	√	√	√	—	√	—	—	√	√
Reflect and Learn	—	—	—	—	—	—	√	√	—	—	—	—	√	—
Other Tools	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Management Tools	—	—	—	—	—	—	√	√	—	—	√	—	√	√
Management Boards	—	—	√	—	√	√	√	√	—	—	—	—	√	√
Centralized Management	√		—		—		—		√		√		√	
Configuration Management	—	—	√	√	√	√	—	—	—	—	—	√	√	√

Figure 7.3: Disciplines, Aspects and Activities

7.1.3 Adherence to MR-MPS-SW

In order to answer the question "What practices and process among MR-MPS-SW (SOFTEX, 2012) are used among software practitioners in small development organizations?" team and project's documentation and acts were analyzed according to MR-MPS-SW results. The summary of the first analyzes result on the adherence to Project Management Process from MR-MPS-SW (SOFTEX, 2012) is exhibited in Figure 7.4.

In the sample, we had three organizations with a maturity level in MR-MPS-BR (SOFTEX, 2012), B, *C* (although it expired along our research) and *F*. From them *F* was level F and the others level G.

The project management maturity was observed more in C and *F1*, then in the others. Although, just *C* from the entire sample actually would have any advantage in market, bidding or related with this kind of certifications. If a formal evaluation would be conducted at the begging of the observation, only *C* would maintain its level of maturity. *F1* would get down to level G. After the interventions, the evaluation would find the adherence in organizations *A, B-2, C, E, F1* and *F2*.

Expected Results		A	B1	B2	C	D	E	F1	F2
GPR 1	Scope Definition	P	L	L	T	P	P	L	P
GPR 2	Products and task estimation	N	N	P	L	N	N	L	L
GPR 3	Life Cycle definition	N	T	T	T	N	N	T	T
GPR 4	Effort and cust estimation	P	P	P	L	P	N	L	L
GPR 5	Schedule, milestones and budget definition and maintenence	P	P	P	L	N	N	T	P
GPR 6	Risk Identification	N	P	P	P	N	N	T	N
GPR 7	Human Resources and knowledge definition	N	L	P	L	P	N	T	T
GPR 8	Other resources definition	N	T	T	T	N	N	T	T
GPR 9	Project data identification	N	T	T	T	N	N	T	T
GPR 10	Stabilish a Plan	N	L	L	T	N	N	L	N
GPR 11	Project viability analysis	P	N	N	T	P	P	P	P
GPR 12	Project Plan revision	N	N	N	L	N	N	N	N
GPR 13	Project Parameters Monitoring (Scope, schedule, cust and estimatives)	N	N	L	L	P	P	L	P
GPR 14	Project Parameters Monitoring (Human and non human resources and data)	N	N	T	T	N	P	T	P
GPR 15	Risk Monitoring	N	P	N	P	N	N	L	N
GPR 16	Stakeholder envolviment Plan and monitoring	P	L	L	T	P	N	T	L
GPR 17	Milstones review execution	N	N	N	T	N	N	T	T
GPR 18	Problem identification and analysis	N	L	L	L	P	P	P	N
GPR 19	Action response	N	P	P	P	N	N	N	N

Figure 7.4: Adherence to MR-MPS-SW

7.1.4 Most Common Problems

Each organization, team, context had its own problems, although some of them were very common or usual in the observed sample. Even though they were analyzed separately, this section presents the list of the most observed problems. All problems were grouped in an issue backlog, prioritized by the project manager (or product manager or plant manager) and leaders (scrum masters or technical leaders) and always revised along the intervention. Every problem came from several evidences and a causality analysis made along the case study.

The product backlog had the priority suggested, the earned value perceived by the team and project manager, the problem, the reflections suggested written in questions, theory associated to help the discussion and reflections and also some actions and observations made by the researchers in action. The problem backlog was presented in order to confirm it and prioritize them. Moreover, the idea was also to empower the reflexive practitioner and the practitioner-researcher. To each organization was also pointed the evidences that pointed or corroborated each problem, even though they not often wanted to see it.

Figure 7.5 depicts in a table, the most common problems in between the eight organizations. And also points out some of the reflections presented with the product backlog.

Problem Backlog		
Org.	***Problem***	***Reflecting question***
A, B, D, E and F	(I) Absence of Reflection	Does your team have any time to reflect about what went wrong and what could have been done better?
A, B and D	(II) Blaming Culture	Is the blaming mood around? Is your team more worried about blaming someone for the bug, problem or issue than to solve it?
A, B, C, D, E and F	(III) Blind Capacity	Do you know what your team is capable of? How much work can you do, how much requirements can we compromise in a week, a cycle, a month?
A, B, C, D, E and F	(IV) Living the Problems	Are living the problems instead of solving the problems?
A, B, D and F	(V) Unproductive environment	Is your team ambient too noisy or the interruptions are driving away your productivity? What are nowadays our team's productivity villains?
A, B, D and E	(VI) Unclear Goals	Do you have an unclear goal? Can't your team know or tell what must be done?
A, B, D and E	(VII) Lack of Quality	Is your product producing more bugs then you can correct? Is your backlog of bugs bigger then you requirements backlog?
A, B, D and E	(VIII) Lack of Visibility	Are you unaware of what is going on with your team's activity?
A, D and E	(IX) Endless Operation	Is your work with no end neither beginning and seams to take forever with no partials winnings?
A, B, C, D and E	(X) Lack of wins	Are you tired of never celebrating a victory?
A, B, D and E	(XI) Lack of Commitment and trust	Are all your initiatives top down? Is the owner or team leader the only one doing the talk? Is the goal always unrealistic? Do you care to make sure that your team buys what you say?

Figure 7.5: Most common problems

7.2 Most Common Actions

The methodology in Action Research can be seen as an alternative to intensify the execution of relevant studies and the acquisition of great value results (BASKERVILLE; WOOD-HARPER, 1996). The initial stimulus for the rise and design of the main action research objectives and aspirations came from a generalized difficulty at the time of translating the results of social research into practical actions (CARR, 2006).

In this line of thoughts, based on the project actuality found with the ethnographic studies, our approach added activities in order to make a difference to the communities involved in the

research. Action research seemed to be the best way to translate project actuality understanding into project, team and organization enhancement.

Based on the scenario (context and diagnostics), the second part of our qualitative research is an intervention based on Action Research. Following our approach, the action research happens during the activity "Engage in Active Interviewing". In this section we present a few improvements opportunities, problems or issues and the actions that came out of the rethinking and reflecting in action. Regardless of the amount of actions, the idea is to introduce at least the most relevant group of actions according to the organizations necessity to grow and evolve.

Plenty were the actions we carried along the study, from the action plan idealized. Many actions were executed facing the problems exhibit in Figure 7.5. Always coming from a situation or problem and aiming at overcoming a problem, such as: going from not knowing what we are capable of and how much time is necessary to accomplish some task, to estimating with the use of complexity and relative sizing; from living the problems to solving the problems; from lack of behavior competence to better leadership skills; from lack of visibility to a transparent management system; and so on. Some of them target not just the problems, but foundation for future actions. The most relevant one are described along this section.

7.2.1 Introducing the Rethinking and Reflecting Meeting

Absence of Reflection is *problem I* in Figure 7.5, without overcoming this barrier, probably once the study was finished they would stop the reflection and rethinking.

Since the beginning, there was not a specific moment to engage in active interviewing, every opportunity was used. Nevertheless, the teams' meeting that dealt with results or retrospective[1] had the greater opportunity for reflection, rethinking and executing the action research. Although just organization C was already using retrospective techniques. So the first mission of all was to help team and manager introduce cycles (sprints (SCHWABER, 2004) or interactions (KRUCHTEN, 2004)) and at the end of it a retrospective meeting. The cycle in their work was also the first step to arrange themselves as projects.

Later on, after helping the team engaging in reflection, retrospective meetings were introduced to all the organizations in the sample, except for C that already used it. It turned into the perfect opportunity to not only see what could be improved from the cycle, but also to see the problem, reflect and act on it. By reflecting the practitioner-researchers tried to analyze the best solutions, group of techniques or behavior to solve the problem or avoid the threat. The moment was usually after the end of the cycle or a important deliverable, as presented in Table 7.1. The organization *C* was omitted from the table since it already had reflections before our intervention.

[1] Scrum meeting dedicated period at the end of each cycle, called sprint, to reflect on how they are doing and to find ways to improve.

Table 7.1: Reflection Moment

Organization	Reflection Moment chosen by each Organization
A	Meeting after each important deliverable - end of implementation cycle.
B	Retrospective meeting after the sprint - two or three weeks sprint.
D	Meeting every milestone, monthly.
E	Retrospective meeting in the end of every other sprint.
F	Weekly, every sprint in the beginning and monthly on bigger issues and after the end of the research.

7.2.2 From Operations to Projects

The second most important reflection was about project concept. Not only what says the literature, but what fits to their goals. This reflexion came from another problem that we have faced, the Endless Operation (IX). Only organizations *B, C* and *F* were already organized as projects, i.e., organizational structure based on projects. And those organizations reflected about how to have more organizational change throw projects.

The problems effects were many. One of the evidences for Organization *E* was an affirmation in a meeting saying, "Today there are about four versions per month or more. It is costly and takes too much time." Every organization reflected about their own project definition, such as: new product version; a product gap to be accomplished in order to meet customer needs; a slice of time, two to four weeks of work, with demands from several clients or several systems; a new system module delivery to meet legal demand; among others more traditional like group of outcomes would turn out to make sense in this temporary endeavor. We present a brief of their decision:

- Organization `A`
  - New product version or deployment to customers with a new set of features (internal or legal - planning to meet constant legal demands).
  - A gap to be accomplished in a product or in order to meet customer needs.
  - The project will typically involve: Actions (blueprint) or Raising the gap; Development of specifications (Idealized but neither accomplished nor seen during the research); Data mapping and upload; Training; and Implementation and monitoring.
- Organization `B`: Even though *B* was already organized as projects, the reflection regarding the project concept was necessary due to another problem, blind capacity, which is the difficulty to coordinate outside project from inside projects. The reflection included the higher management, the Operational Director and some other

leaders that were senior employees. They were only organized timely (every 6 weeks a new official deploy), and the objective was to synchronize with outside projects and the main strategic goals. For that every two weeks they had their own "portfolio" meeting and they started prioritizing demands that would turn into projects. A few small "outside projects" (gaps to implant a product in a new client, legal demands, new demands from a strategic client) could turn into one project. In addition, a medium "outside project" (new product) could turn into a few projects. For the higher management this was the best result from our research.

- Organization `D`
    - Delivery of a new system module to meet legal demand;
    - Set of enhancements over a period of time;
    - For new products, a module would be a project, simpler because we do not have customers.
    - A project will not consume 100% of team's time. Ideally only 50% to 60% will be allocated.
    - The bugs, minor enhancements and the help to the support team will be conduced in the 40-50% not allocated in the project. For these, the priority will be set weekly by the owner.
- Organization `E`
    - Software Migration for a current version;
    - Important new module version, such as *NF-Eletronica*;
    - Reports Migration;
    - Features Set (requirements);
    - Parts of a new product, either a module or a set of requirements associated;
    - Initially it was given a monthly concept (2 fortnight cycles) for the project;
    - As the matter of releasing versions. We will have new monthly versions, in a specific day of the month, or 2 days per month. "Today there are about four versions per month or more. It is costly and it takes too much time." The new concept of project will put in practice this change, to have a version released, it must have been planned a milestone for release.

Even though *F* had a project plan, it was not really used by *F2* and sprints were what really mattered for them. For both teams, they realize that most of the effort to analyze indicators makes more sense once tied to a project. Also they use to loose too much time every week (sprint) and it fitted much better when encompassed as project and for each project.

7.2.3 From Lack of Visibility to Visible Management System

A lack of visibility or pre-visibility problem was noticed and pointed by the team members, leaders or clients. This improvement point also came from the owners or leaders centralization control, that even sometimes made teams stop working, sit back and wait. The following were the actions resulted from the rethinking and reflecting on these issues:

- Organization A: The adoption of physical kanban (SUGIMORI et al., 1977) boards. It took us over two months to make it work. And this was the most visited organization. And enhancement in their proprietary tool in order to deal with projects.
- Organization B: The adoption of physical kanban (SUGIMORI et al., 1977) boards. In order to work, the teams had to move and sit together and closer to their board. We heard a client asking if they were already "in the board", in regarded to the idea if their demand was already prioritized by the portfolio and already planned as a project.
- Organization C: Tools analysis and the adoption of Redmine [2] as a management tool. They used a paid outdated non-web tool, the migration was not easy, but it was for the best. They had already used a task board.
- Organization D: The support team adopted a kanban (SUGIMORI et al., 1977) board. A huge 2,5m x 1,5m white board.
- Organization E: Tools analysis. And the adoption of Redmine as a management tool. They had already experimented the product on development in Java, but only after the interventions that all projects were planned and managed with the help of the tool. A scrum plug-in was also adopted. The owner could see, plan and monitor from anywhere. The best experience of all as a matter of open minded team and leader.
- Organization F: New indicators started to be collected in order to give better view on the waste of time, bugs origin the impact of non planned requirements.

7.2.4 From Lack of Behavior Competence to Better Leadership Skills

Some improvement opportunities did not come from technical issues, but from behavioral competence — lack of leadership. According to ICB (ASSOCIATION et al., 2006), there are three ranges containing related competence elements:

- Technical competence elements deal with the project management matter, on which the professionals are working. It covers the project management content (solid elements);

[2] http://www.redmine.org/ — Redmine is a open source, flexible project management web application. Written using the Ruby on Rails framework, it is cross-platform and cross-database.

- Behavioral competence elements deal with the personal relationships between the individuals and groups managed in the projects, programmes and portfolios. It covers the project manager's attitudes and skills;

- Contextual competence elements deal with the interaction of the project team within the context of the project and with the permanent organizations. It covers the project manager's competence in managing relations with the line management organization and the ability to function in a project focused organization.

In our review it was easy to find out that the contextual competence is completely different from the context mentioned in this work. Insofar the treat context as: Project orientation; Programme orientation; Portfolio orientation; Business systems; Products and technology; Personnel management; Health, security, safety and environment; Finance; and Legal — it all describes the impact of the law an regulations on projects and programmes. But their worries are to avoid lawsuits.

In this research, we treat the variable context as multiple images and aspects of a specific team in a specific project. How their social interaction and human interaction impacts the moment of the project. How they react to the pressure of the incoming change in legal aspects, team's emotional maturity regardless of the PMBOK (PMI, 2008) aforestated in Chapter 4, that we agree as project management context.

Anyways, to organizations A, C and D, as a behavioral competence improvement opportunity, the following action came out of the reflections based on (ASSOCIATION et al., 2006) and agile methods:

- Organization A: Distribute leadership tasks. Even if it was not enough, it was beginning to see them realize, by themselves, that some problems could be resolved with an act of delegating tasks. "A good leader can delegate, has confidence in others and coaches them to develop and live up to expectations" (ASSOCIATION et al., 2006). They also identified the productive time and signalized their desks with colors. Red meant "Do not disturb I am in a productivity flow". Once I got in, got close to a java leader programmer and he smiled and pointed to his red flag. It was in intent to educate the support, that always interrupted, the owner, the researcher and their pairs. The idea was to use the red flag during the part of the day when you are really focused.

- Organization C: The project manager was new in the organization, so they realized that until he felt more comfortable and aligned with the team, he would have to do every plan, every meeting, everything with the team. This showed or generated a lot of behavior competences such as engagement, motivation, assertiveness, relaxation and openness.

- Organization D: The pressure, the centralization, and the dependence were unhealthy. The owner started to delegate. It took almost all the time there and this came out in several reflections meetings in order for the owner to realize he was the problem.

- Organization F: One scrum master was substituted to both it was explained the importance of the energized work and the role of scrum master in each ceremonies, according to Schwaber. (SCHWABER, 2004). Besides many task was also delegated to the project assistant.

7.2.5 Major Changes in Order to Achieve Productivity or Cohesion Teams

Problem V, related to lack of productivity, had the most unexpected and different actions. One of them was called "Major changes in order to achieve productivity or cohesion teams". Organization B, D and E went through some changes regardless of techniques, after engaging in rethinking. The most relevant ones to point out, were:

- Organization B: had a re-distribution of the teams inside their room to sit together, reduce the noise and facilitate the communication.

- Organization D: Total change in the organization's physical structure. Coming from a single room with a hybrid profile (developer + support analyst) to everyone, but the owner, to separate offices and separate positions. It also changed the communication flow, as presented in Figure 7.6. As the researcher got in, on a Monday morning to the enterprise, after a trip on a Sunday evening, the product manager — the owner — said "I want you to meet someone". And an hour later he introduced me the architect. Proudly showed the blueprints which separated, after six years, the development team from the support and let him in the middle, on a much more modest office space than the one he had up to that moment. The owner's previous office turned into the development room, with three people only, and as the senior programmer left the organization, the office still had two open spaces. The senior developer, who is also a partner, took over the team management and had a separated desk. One developer stayed in the support room, the only one really divided into the two positions at the moment (support and developer), but came to the room as demanded. The support team's office was the old one, divided with the owner, by a full brick-wall and some glass, but it still has enough space for 6-7 people in the support team. There is a huge task board and a separated space for the other senior employee, who was also a partner, and now he is the support leader. The support office has enough space for other 4 people if they need it, easily. Besides, if there were small changes such as better use of inside phones and less yelling around, as well as a mobile phone politics for a better-focused and productive group. In general, the action was the definition of a good coexistence policy or productivity policies, towards a productive team.

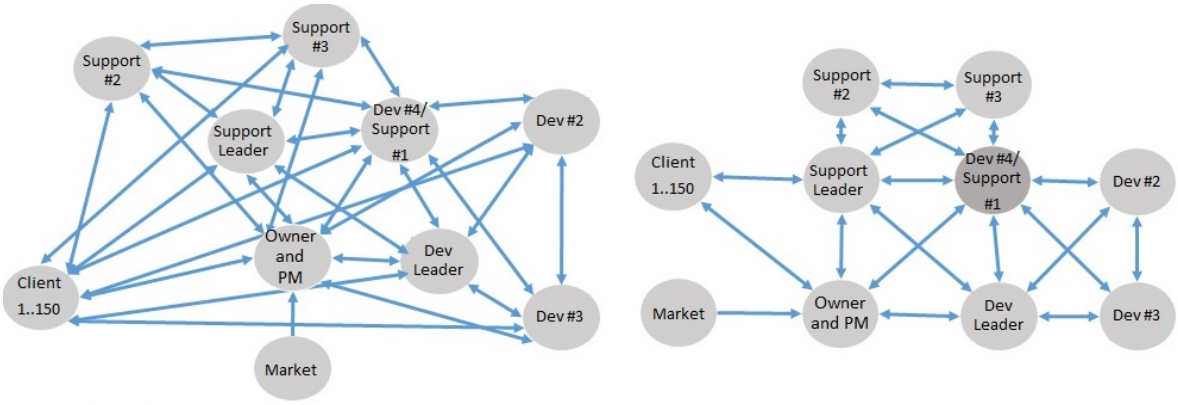


Figure 7.6: Communication Map Before and After the Intervention (D)

- Organization E: A full hall has changed places in order to give space for a taskboard. Later on they realized that the Redmine board was good enough.
- Organization F: All ceremonies and its content were changed, gaining in total 2hours a week.

7.2.6 Plan and Execute Test to Enhance Product Quality

In response to **problem VII**, most organizations in the sample reflected about the quality of their products and the return rate (associated with number of requirements with bugs).

Different actions were conducted, and almost every team managed to initiate or enhance their testing tasks and skills. Rethinking the activities that were already done about the product's quality, some organizations figured it out that they had no "done" concept for their tasks and no success definition for their cycle or project. For example, organization *B* found problems such as: "Deployment on the client currently generates inconvenience to the elaborated Project Plan. Several development and testing activities are carried out in the field and sent to the team impacting business goal and the quality of the issued release"; and "team member's activity were submitted on branch of the Project, authorized by the PO, impacting activities and quality of the product and project". Some actions tried to address this misuse of the process and practice. In summary, they engage on several cycles of rethinking in order to enhance the quality of their product, some opportunities to engage on rethinking are presented as follows:

- Organization A: New test activities were created and a cycle and then a project success were defined.
    - It was defined what are the major concepts to be tested within the product and within the project and formally test them after each cycle. The support team was empowered not only to exploratory test, but also formal tests through test cases.

- A project success rate was defined. As one of their worst problems was how to charge and estimate, they reflected several times about it. They defined a satisfactory success rate from 61% to 80% of scope completeness(tested, delivered and approved) and assertiveness in estimation, and a good rate to greater then 80%.

- Organization `B`: New test force, with new employees and business analyst (not a team member) helping in different moments (system test and acceptance test), no activities will be done on client fields. Besides the adoption of TestLink[3], an open source test management tool for management the test discipline and also made it possible to reuse test cases. Some enhancement opportunities detected after reflecting:

  - The tests are not good enough, they are not worth it. Just simple things are pointed out;
  - "Deployment on the client currently generates inconvenience to the elaborated Project Plan. Several development and testing activities are carried out in the field and sent to the team impacting our business goal and the quality of the issued release";
  - "Another team member's activity was submitted on branch of the Project, authorized by the PO, impacting activities and quality of the product and project".

- Organization `C`: This organization already had formal and exploratory test. The use of TestLink to manage the test connected to Redmine, helped the reuse of the test cases. Later on, a part-time employee was hired to help with tests.

- Organization `D`: All testing, besides the unit informal test, was executed by the support team. The unit test was a cross check in between the two programmers, besides the leader programmer. He did not believe that it was necessary test his tasks. Training on the system made by the programmer or support analyst, in part of the system that they are not specialized was also an action to improve quality on the product.

- Organization `E`: Formal test was mandatory only to requirements with bigger complexity. Besides, a programmer that was not involved in the development would do the test. Before releasing to the client, a support member, who was interested in being a member of the development team, was allocated to test the system. For the Ongoing product, not yet with clients, every version would be tested by the support as well.

[3] http://testlink.org/

- Organization F: Complex requirements would be broken into smaller requirements in order to facilitate the partial test. Other team members helped in “test forces”, to guarantee the completeness.

In summary, the organizations engaged on several cycles of rethinking in order to "Enhance the product’s quality", with the following derivative actions related to the test:

- New test activities *(A, D, E) and F*;
- Work with product risk analysis *(A, D)*;
- Using support analyst for testing *(A, D, E)*;
- Hiring or allocating new test force *(B, C) and F*;
- And acquiring New tools (Testlink) *C)*.

The understanding of project actuality helped the identification of every organization main problems. Some of them the research could help, such lack of productivity, lack of visibility, lack of problem solving and others. There was problems that we could not deal with such as the government impact on requirements or the impact of the dollar price on the operation due to the actual government politics. Other reflections and results were executed but those above mentioned were the most common ones.

7.3 The Feedback

As we had many cycles, the feedback was continuous. Every time an action was embraced and gave immediate results, trust and commitment were renewed. Besides, the satisfaction of seeing the organization’s growth after each overcoming problem was priceless and also felt as a feedback.

All the formal feedbacks were qualitative as much as the rest of our study. The most interesting ones were:

- *B*: "The Portfolio vision was the best action of all. We can finally be predictable and we can finally give some visibility to our clients. We really thought we used project until you made us see we really did not".
- *C*: "We had tried that once by ourselves and it did not work. We got more agile and threw away a "heavy casted" process. You were our fairy godmothers".
- *E*: "Every time you came here we learned something new or we gained some new perspective. We are more organized and predictable now; we will try to keep the reflection at least every other month". Feedback given after five months of the last intervention.

- *F*: "When we do not know what to fix, we change everything. As in some car workshop I went to last month. They gave me a budget of R$960 reais to exchange all the car's suspension just to solve "a" problem on the car's suspension. I got a second opinion and it turned out to be R$110 reais. I went back in the following week and I saw a new mechanic; I asked him to take a look at my car. After a long observation and analysis he told me "If you authorize the service, I will exchange *This* (pointing to a part of the car's suspension system). If it does work, we will exchange this other one and so on." In the first try, the car was as good as new and the cost was R$80 reais for the part, plus R$70 for the service. And then I asked: How can vary so much the price? The mechanic answered "Doctor, when we do not know where the problem is, it is easier to change everything." He concluded saying "This work has been like that quick fix I had. You have to analyze deeper in order to find out what we really needed to change and it helped us see it and to exchange only what is necessary. All process improvement consulting should be like this. "

7.4 Proposition Analysis

7.4.1 First Critical Question

This subsection analyzes the first question, related to the approach presented in the thesis "How does the use of an approach that analyzes and understands project actuality phenomenon can support MSEs to enhance its project management practices?" and its propositions. The propositions related with the first critical question are:

- **(P1)** By understanding project actuality we can give MSEs visibility of its problems.
    - By understanding their context, their culture, their motivations it was possible, to all organization on the sample, to find and give them visibility of their real problems. The strategy to focus first on the actuality phenomenon can also be used to help process improvements initiatives. The value delivered once the real problems are seen in its context is bigger than when you focus only on the accomplishment of a adherence. The preposition was valid and true for all cases.
- **(P2)** By understanding project actuality we can help MSEs enhance its project management practices.
    - by understanding the actuality and identifying the problems, all the organization agreed with the interventions and improved their project management practices. Although not all PM practices were prioritized by the organizations, a few was carried on and monitored to its efficacy. Such as:

The organization as projects and the use of a formal project plan (A, D and E). From the ones that already used plan they improved the project concept and and designed a better strategy for planning and monitoring (B, and F). They introduced monitoring and closure activities such as indicators and retrospective (A, B, E and F). Only organization F was the one that had the smallest enhancement of them all. Mostly they started to have a project plan and to use some agile estimations techniques. The feedback also endorses that the preposition was valid and true.

- **(P3)** MSEs can awake to project management best practices and productivity through reflection.
    - The reflection was the major driver for all changes and accomplishments. One way to understand and analyze problems and seek in theory the best solutions to these problems. Although there is not evidence that the reflection based on theory will continue. It is more expected that only the problems analysis or the waste analysis continue in all organizations. The preposition was valid and true for all cases, but there is not enough evidence to guarantee that it will continuous without help of an facilitator.
- **(P4)** Project is as rare concept in small software development organization.
    - Only one organization in the sample (C) fully used the project concept. And they dealt with government clients that usually demands project documentation. B had the wrong concept, and F1 used it poorly. In our sample, project was not a common concept, but it was not rare its use. The preposition is not valid, although it was unusual, it was not a rare concept.

Returning to the question, our finding shows that the use of an approach that analyzes and understands project actuality phenomenon can definitely support MSEs to enhance its project management practices. It helps the practitioner to stop and understanding their actuality and seeing the real problems. Moreover, help them engage in reflection and overcome a waste , a lack of management practices problem and any other problem. For an researcher to blend as similar, to involve practitioners into research and action.

7.4.2 Second Critical Question

This subsection analyzes the second critical question, related to findings on project actuality "How does project management works within project actuality in MSEs?" and its propositions. The propositions related with the second critical question are:

- **P5** There is little or no use of PMBOK practices in small software development organizations.

- Indeed there is little use of the PMBOK in the MSEs of the sample. Those who knows about it does not think it fits to this kind of organization, not because of its size but due to the complexity of the maintenance routine or scarce resources.

- **(P6)** The project management practices are not systematized in this scenario.

  - Indeed project management practices are nos systematized in the MSEs that are in the sample. Many tacit practices, generating dependence on people are usual in this scenario.

7.5 Research Validity Analysis

Regarding the validity of the research and its constructs, the approach used multiple collecting methods such as observation, interview, documentation analysis and participant interview, as previously established in chapter 3.

Regarding the trail of evidence, we first analyzed each case individually with the help of the ATLAS.ti, the sub-questions and drivers-analysis. Then we crossed the data from all case studies. The sub-questions are related to the propositions and are supported by theoretical foundation such as PMBOK (INSTITUTE, 2013), IPMA (ASSOCIATION et al., 2006), MPS-BR (SOFTEX, 2012) and Scrum (SCHWABER, 2004).

In every cycle of observation and discovery, the data was presented to organization in order to validate the data and its correct understanding. We believe that by the diversity of data collection methods, the traceability to the theory and the validation by the organization that we presented the actuality phenomenon. Not always the project actuality was analyzed but the actuality of the team and its work.

We focused on the data, not on the researcher's perspective. For that the approach inducts that each case study would start with observation and understand for just afterward ask questions. Each observation took at least two months.

At last, regarding the countability of the research, we followed our research strategy. All steps were executed. Appendix A and B shows part of the instruments of this research strategy.

7.6 Closing Remarks

This chapter presented the aggregate analysis of the multiple cases in order to give an idea of the project actuality phenomena in micro and small software development organization. All the sub questions and analysis-drivers were presented with its analysis and comments. Some of them in tables to facilitate the visualization. All propositions were analyzed and presented. At last the research validity was discussed.

The combined results analysis showed that the approach helps the understanding of the actuality phenomena. The analysis can give an idea of the MSEs actuality. Definitely PMBOK is not used. Moreover, project management practices are not systematized, and the project concept is not a common aspect in this scenario. Although the organizations manage to accomplish many clients and stay lucrative.

Finally, by understanding project actuality and reflecting with the organizations and its teams, this research could help the overcoming of many challenges and problems. In addition, enhance its project management practices.

8

Final Considerations

Finally, after presenting the research results, this chapter presents the conclusions, the main work contributions, discusses some limitations and future prospects.

In the experimental software engineering paradigm, the relationship between practitioners and researchers is highly symbiotic (BASILI, 1996), since researchers need laboratories — research field to observe and manipulate variables — software projects context is the ideal environment. On the other hand, practitioners need to understand how to step up and improve its competencies, processes and results. Researchers are the best option to assist in this task. From this perspective, this thesis described research laboratories (organizations, teams and project) and research variables such as impact factors, adopted techniques, project management maturity, project stakeholders and project context from six small software development organizations.

8.1 Conclusions

Along this research, an exploratory and a systematic review was conducted in order to create an approach enabling academics and practitioners to investigate, observe and analyze software project actuality phenomenon. In doing so, providing a framework for studying the organizational, context, team culture and for uncovering the knowledge, ideas, beliefs and values surrounding project management. Six case studies were conducted to refine and evaluate the approach and unveil actuality phenomenon in micro and small software development organizations in Brazil. The case studies used ethnography techniques and it contributed to a better understanding of the critical issues surrounding project management in small software development organizations.

The first idea was to have an approach only to observe and give light on project actuality findings. But the first two case studies presented a scenario worth intervening. So the second version of the approach was created to supported team reflection. The reflection and interventions were based on the actuality phenomenon that emerged from the approach execution throughout the case studies, where researchers and practitioners came into systemic reflections that have led to improvement of these organizations.

It was possible to build a theoretical approach to support analyzing and understanding project actuality phenomenon and support MSEs to overcome their problems by helping them to engage in reflection. The approach is useful for any researcher or practitioner that wants to analyze project actuality phenomenon. Moreover, it can help small organization to analyze its project management practices and organization's operation in order to reflect and act overcome problems.

At the last case study, a third party was involved to conduct the case study and to use the approach. Although some difficulties were found, about exit criteria of the activities, the first part of the approach was considered "simple and easy". For the reflection part of the approach, it was executed in partnership with researchers in action from the organizations *E* and *F*. Both of them had no problems conducting the planning and the reflections moments. Based on the aforementioned feedbacks and on my experience of using or leading the usage of the approach, there are signs that leads us to consider the approach with a good usability.

By analyzing the discourse and tags, people's interactions and attitudes, documents and the workspace we explored the organization, team and project actuality phenomenon. Our work presents what in fact has been used to manage projects and also what kind of factors have impacted project daily routine in small software development organizations. Primordial to understand how to support small organizations.

The case studies presented that in our sample, most of the organizations had one or more products and some times hundred of clients. We also found out that bodies of knowledge are known but not used in this kind of organizations. Risk management is a far distant discipline, where risks was not identified correctly or controlled for none of the organizations. Definitely not a reality along with problem analysis. Cost did not considered the project unit, just operation cost was considered in most cases. In addition, the organization did not have any reflections, retrospectives or lessons learning in the end of the sprint or project. Only organization C had reflections as retrospective meetings. In the other hand, test activities were present in almost all organization in the sample. Agile practices ares used but not integrally, the simple idea of reflecting and learning every cycle was rarely used.

Most teams have members with multiple roles due to the lack of resources. When this "other activities" are outside activities, it complicates team's results. Inside team multitasking and roles were not a problem.

For A and F, the owner had a centralized and unhealthy involvement with the team. The pressure, the continuous interference, and centralization were always a hit on teams performance and motivation. However, by far, the government is the biggest villain on this scenario, as it is always demanding new legal requirements without clear documentation or client support and unrealistic deadlines. Not to mention the moment in which Brazil is going through, by itself is a big issue to MSEs.

Action research was executed to help the intervention step of the approach. It focused on solving organizational problems that emerged throughout the case studies and that were

prioritized to reflection and action. The reflection contributed to team's knowledge creation and organizational knowledge creation. Theory came from PMBOK (INSTITUTE, 2013), MR-MPS-SW (SOFTEX, 2012), Scrum (SCHWABER, 2004), Lean (POPPENDIECK; POPPENDIECK, 2003) and XP (BECK, 2000). It was used to help the reflection and to introduce the actions. We helped other researchers in action to evolve in their productivity, reducing waste and enhance their project management practices. Feedback were collected in order to evaluate the approach and the research study.

The actuality findings showed that not all organization uses the project concept. For the three organizations that did not use project concept, to define software development operational work as projects was one of the first interventions agreed by researchers in action. As most of the organization or teams dealt with product maintenance, a temporal project concept was the easiest way to initiate the definition project that must accomplish clear goals. The project also helped to introduce the "end" sensation that allows the victory, the accomplishment sensation.

Most of the organization opted to adopt agile methods (A and E) or already used part of it (B, C, F). Just one team opted to follow MR-MPS without the agile methods (D), although the support team (previously just one team), began to use agile techniques to manage their activities. We also found out that bodies of knowledge are known, but not used in this kind of organizations.

Considering the expression of the MSEs market, and the results, we conclude that this type of organization is a great opportunity to researchers as well as for practitioners willing to embrace and enhance the Brazilian software market. In order to really make a difference, we must engage on helping them to rethinking, reflecting, adapting and evolving. Always beginning with what they already have. Seeking for complementary knowledge is necessary but it does not come first, but as a consequence. The approach developed along this thesis helps the understanding of the actuality.

This research contributes to the project management area, by uncovering the project actuality in software development organizations. In addition, it contributes by giving an approach to help understanding this phenomenon and help organizations to engage in reflection and improvement.

8.2 Contributions

This research offered two main results. The first was the approach to investigate, observe and analyze software project actuality phenomenon. Moreover support team on reflections about its context and acting to overcome its problems. The second was the visibility of actuality phenomenon in six MSEs from the Northeast of Brazil.

Some contributions can be highlighted about the research methodology adopted in this thesis. A systematic review was conducted and the data is available for further research (SAMPAIO; MARINHO; MOURA, 2014b). Six case studies were conducted using Yin (YIN, 2014) orientations. Besides, action research (LAU, 1999; DAVISON; MARTINSONS; KOCK,

2004) studies were conducted in all organizations in the sample.

From the perspective of six organization involved, the execution of the step "Engage In Reflection" made possible some actions that changed their actuality. All actions came from the reflection based on the actuality enlighten by the approach execution. The study helped 8 teams, from 6 organizations to overcome their problems. All organization improved their visibility and control, some of them mentioned a higher productivity (A, C, HF and E), more clients (E), more quality (A, C, D and E), newer and wiser technology (C and E), visibility and control (A, D and E) and last waste (E and F).

The different phases of this thesis also generated publications in international journal (SAMPAIO; MARINHO; MOURA, 2014b), and conferences (SAMPAIO; MARINHO; MOURA, 2015; SAMPAIO et al., 2015), and national qualified workshop (SAMPAIO; MOURA, 2014).

As a researcher, this research has been a life changing. Where a practitioner turned into a researcher. Also contributing to my academic maturing, through the interaction with other researchers, academic events and the contacts with the scientific community.

8.3 Limitations

As any qualitative research, as culture is always evolving, the findings are context and time dependent. Besides, all case studies were conducted inside The Northeast of Brazil. Even though pre-reports, graphics, and resumes were presented to the participants to confirm its understanding, unfortunately, there was only one researcher most of the time and it was not possible to compare notes and observations.

Although positive feedback has been collected from all the organizations in the sample, the approach's usability was evaluated only by me. As I conducted all the case studies and action research, there is no evidence that a practitioner can easily use the approach. In organization F, we involved a third party and it worked well, but she was not involved since the planning.

In addition, there is no evidence along our work that the team will chose correct the theory to support the reflection, since I helped all teams with that task.

8.4 Future Works

The approach created and presented in these thesis, allowed the identification of some patterns between organizations from the case studies. In doing so, we shine a light on project actuality phenomenon. Considering the approach in its current state and the data on project actuality, we consider the following future works:

- Evaluate the approach usability by observing its use and execution by a third party;

- Research Extension: Some aspects related to the approach and the context that was applied in this thesis can be explored in further research, including transforming some findings into a questionnaire, to elicitate quantitative data in order to enable generalizations. Solid information could motivate guides or more adaptation from the models and body of knowledge for MSEs;
- Research replication
    - New research can be carried out with the purpose of replicating the research in different contexts, such as medium and large organizations. Contributing for a better understanding of the critical issues surrounding project management in this size of organizations. Moreover, analyzing if the approach is suitable and what with kind of adaptation would be necessary;
    - Research in other areas such as engineering, innovation, and research. Analyzing not only if the approach is suitable for this new context but what kind of adaptation would be necessary.
    - Executing the approach in a case study outside Brazil, analyzing and comparing the actuality from two different countries.

Bibliography

A METHODOLOGICAL LEG TO STAND ON: LESSONS LEARNED USING GROUNDED THEORY TO STUDY SOFTWARE DEVELOPMENT. **Anais...** [S.l.: s.n.], 2008. p.13.

ADOLPH, S.; HALL, W.; KRUCHTEN, P. Using grounded theory to study the experience of software development. **Empirical Software Engineering**, [S.l.], v.16, n.4, p.487–513, 2011.

ALONSO, J. et al. Enterprise collaboration maturity model (ECMM): preliminary definition and future challenges. In: **Enterprise Interoperability IV**. [S.l.]: Springer, 2010. p.429–438.

ANGELO, A. S. Entendendo o PRINCE2. **Revista Mundo PM Edicao Mai/2008**, [S.l.], 2009. `http://www.mundopm.com.br/noticia.jsp`.

ASSOCIATION, I. P. M. et al. **International Project Management Association Competence Baseline**. [S.l.]: Version, 2006.

AVRAM, G. et al. Examining life at the code face. In: COOPERATIVE AND HUMAN ASPECTS OF SOFTWARE ENGINEERING, 2008. **Proceedings...** [S.l.: s.n.], 2008. p.5–8.

BASILI, V. R. The role of experimentation in software engineering: past, current, and future. In: SOFTWARE ENGINEERING, 18. **Proceedings...** [S.l.: s.n.], 1996. p.442–449.

BASIT, T. Manual or electronic? The role of coding in qualitative data analysis. **Educational research**, [S.l.], v.45, n.2, p.143–154, 2003.

BASKERVILLE, R. L.; WOOD-HARPER, A. T. A critical perspective on action research as a method for information systems research. **Journal of Information Technology**, [S.l.], v.11, n.3, p.235–246, 1996.

BAXTER, P.; JACK, S. Qualitative case study methodology: study design and implementation for novice researchers. **The qualitative report**, [S.l.], v.13, n.4, p.544–559, 2008.

BECK, K. **Extreme programming explained**: embrace change. [S.l.]: Addison-Wesley Professional, 2000.

BECK, K. et al. **Manifesto for Agile Software Development**. `http://www.agilemanifesto.org/`.

BELL, J.; GOULDING, S. **Conducting small-scale investigations in educational management**. [S.l.]: Harper & Row, 1984.

BENGTSSON, P. **Multiple Case Studies–not just more data points**. [S.l.]: Citeseer, 1999.

BENNET, A.; BENNET, D. A new change model: factors for initiating and implementing personal action learning. **VINE**, [S.l.], v.38, n.4, p.378–387, 2008.

BENTLEY, C. **Prince2**: a practical handbook. [S.l.]: Routledge, 2009.

BOEHM, B. W. Improving software productivity. In: COMPUTER. **Anais...** [S.l.: s.n.], 1987.

BOEHM, B. W. et al. **Software engineering economics**. [S.l.]: Prentice-hall Englewood Cliffs (NJ), 1981. v.197.

BOGDAN, R. C.; BIKLEN, S. K. **Qualitative research in education. An introduction to theory and methods**. [S.l.]: ERIC, 1998.

BOUD, D. et al. **Reflection**: turning experience into learning. [S.l.]: Routledge, 2013.

BRAZILIAN Software Market: scenario and trends. 1. ed. - São Paulo: ABES 2013.

CARR, W. Philosophy, methodology and action research. **Journal of Philosophy of Education**, [S.l.], v.40, n.4, p.421–435, 2006.

CHIANG, I. R.; MOOKERJEE, V. S. Improving software team productivity. **Communications of the ACM**, [S.l.], v.47, n.5, p.89–93, 2004.

CHIU, Y. **An Introduction to the History of Project Management**: from the earliest times to ad 1900. [S.l.]: Eburon Uitgeverij BV, 2010.

CICMIL, S. Understanding project management practice through interpretative and critical research perspectives. **Project management journal**, [S.l.], v.37, n.2, p.27–37, 2006.

CICMIL, S. et al. Rethinking project management: researching the actuality of projects. **International Journal of Project Management**, [S.l.], v.24, n.8, p.675–686, 2006.

CICMIL, S.; HODGSON, D. New possibilities for project management theory: a critical engagement. **Project Management Journal**, [S.l.], v.37, n.3, p.111, 2006.

CLIFFORD, J. Workplace learning and development. **Development and Learning in Organizations**, [S.l.], v.22, n.3, 2008.

CMMI Institute. **CMMI® for Development, Version 1.3**. [S.l.]: Carnegie Mellon University, 2010. `http://www.sei.cmu.edu/library/abstracts/reports/10tr033.cfm`.

COMMISSION, E. U. et al. Commission recommendation of 6 may 2003 concerning the definition of micro, small and medium-sized enterprises. **Official Journal of the European Union, L**, [S.l.], v.124, p.36–41, 2003.

COOPER, L. P.; MAJCHRZAK, A.; FARAJ, S. Learning from project experiences using a legacy-based approach. In: SYSTEM SCIENCES, 2005. HICSS'05. PROCEEDINGS OF THE 38TH ANNUAL HAWAII INTERNATIONAL CONFERENCE ON. **Anais...** [S.l.: s.n.], 2005. p.253b–253b.

CRAWFORD, L. Developing organizational project management capability: theory and practice. **Project Management Journal**, [S.l.], v.37, n.3, p.74–97, 2006.

CRAWFORD, L. **World PM trends and the position of P2M in the global community**. Singapore [u.a.]: World Scientific, 2009. 381–402p. (Japanese project management : KPM - innovation, development and improvement. - Singapore [u.a.] : World Scientific, ISBN 978-981-277873-4. - 2009, p. 381-402).

CRAWFORD, L. et al. Practitioner development: from trained technicians to reflective practitioners. **International Journal of Project Management**, [S.l.], v.24, n.8, p.722–733, 2006.

CRAWFORD, L.; POLLACK, J. How generic are project management knowledge and practice? **Project Management Journal**, [S.l.], v.38, n.1, p.87–97, 2007.

CRESWELL, J. W. **Qualitative inquiry and research design. Choosing among five approaches**. [S.l.]: Sage publications, 2012.

CRESWELL, J. W. **Research design**: qualitative, quantitative, and mixed methods approaches. [S.l.]: Sage publications, 2013.

DAVISON, R.; MARTINSONS, M. G.; KOCK, N. Principles of canonical action research. **Information systems journal**, [S.l.], v.14, n.1, p.65–86, 2004.

DEWEY, J. How we think: a restatement of the relation of reflective thinking to the educational process. **Lexington, MA: Heath**, [S.l.], 1933.

DIAS NETO, A.; SPINOLA, R.; TRAVASSOS, G. Developing software technologies through experimentation: experiences from the battlefield. In: XIII IBERO-AMERICAN CONFERENCE ON SOFTWARE ENGINEERING. **Anais...** [S.l.: s.n.], 2010.

DINGSOYR, T. et al. A decade of agile methodologies: towards explaining agile software development. **Journal of Systems and Software**, [S.l.], v.85, n.6, p.1213–1221, 2012.

DOS SANTOS, P. S. M.; TRAVASSOS, G. H.; ZELKOWITZ, M. V. Action research can swing the balance in experimental software engineering. **Advances in Computers**, [S.l.], v.83, p.205–276, 2011.

DUNTON, D. L. Inquiry and feedback: using action learning for transformational change. **Industrial and Commercial Training**, [S.l.], v.40, n.2, p.109–111, 2008.

EASTERBROOK, S. et al. Selecting empirical methods for software engineering research. In: **Guide to advanced empirical software engineering**. [S.l.]: Springer, 2008. p.285–311.

EISENHARDT, K. M.; GRAEBNER, M. E. Theory building from cases: opportunities and challenges. **Academy of management journal**, [S.l.], v.50, n.1, p.25–32, 2007.

EL-EMAM, K.; GARRO, I. ISO/IEC 15504. **International Organization for Standardization**, [S.l.], 1999.

ESKEROD, P. Action learning for further developing project management competencies: a case study from an engineering consultancy company. **International Journal of project management**, [S.l.], v.28, n.4, p.352–360, 2010.

FARAJ, S.; SPROULL, L. Coordinating expertise in software development teams. **Management science**, [S.l.], v.46, n.12, p.1554–1568, 2000.

FARIAS JÚNIOR, I. H. **A Communication Maturity Model for Distributed Software Development**. PhD Thesis. CIn - Informatic Center of Federal University of Pernambuco.

GAREL, G. A history of project management models: from pre-models to the standard models. **International Journal of Project Management**, [S.l.], v.31, n.5, p.663–669, 2013.

GENZUK, M. A synthesis of ethnographic research. **Occasional Papers Series. Center for Multilingual, Multicultural Research (Eds.). Center for Multilingual, Multicultural Research, Rossier School of Education, University of Southern California. Los Angeles**, [S.l.], p.1–10, 2003.

GODOY, A. S. Introdução à pesquisa qualitativa e suas possibilidades. **Revista de administração de empresas**, [S.l.], v.35, n.2, p.57–63, 1995.

GOULD, L. J.; STAPLEY, L. F.; STEIN, M. **The systems psychodynamics of organizations**: integrating the group relations approach, psychoanalytic, and open systems perspectives. [S.l.]: Karnac Books, 2006.

GRAY, D. E. **Doing research in the real world**. [S.l.]: Sage, 2013.

GRESSLER, L. A. **Introdução à pesquisa**. [S.l.]: Edicoes Loyola, 2003.

GROUP, S. **The Standish Group International**. `http://www.standishgroup.com/chaos_news/newsletter.php?id=54` Accessed in April 20th 2014.

HAMMERSLEY, M.; ATKINSON, P. **Ethnography**: principles in practice. [S.l.]: Routledge, 2007.

HIGHSMITH, J. **Agile project management**: creating innovative products. [S.l.]: Pearson Education, 2009.

HODGSON, D.; CICMIL, S. **Are projects real? The PMBOK and the legitimation of project management knowledge**. Faculty of Humanities, Manchester Business School: Palgrave McMillan, 2006.

HODGSON, D.; CICMIL, S. The Politics of Standards in Modern Management: making 'the project' a reality. **Journal of Management Studies**, [S.l.], v.44, n.3, p.431–450, 2007.

HODGSON, D.; CICMIL, S. The other side of projects: the case for critical project studies. **International Journal of Managing Projects in Business**, [S.l.], v.1, n.1, p.142–152, 2008.

IBGE. **Pesquisa sobre o Uso das Tecnologias de Informação e Comunicação nas Empresas**. `ftp://ftp.ibge.gov.br/Tecnologias_de_Informacao_e_Comunicacao_nas_Empresas/2010/comentarios.pdf` accessed in Ago 8th 2014.

INSTITUTE, P. M. **A Guide to the Project Management Body of Knowledge (PMBOK Guide).** [S.l.]: Project Management Institute, Incorporated, 2013.

ISO, N. IEC 12207–Tecnologia de informação-Processos de ciclo de vida de software. **Rio de Janeiro: ABNT**, [S.l.], 1998.

ISO, N. 10006, 2000. **Gestão da Qualidade. Diretrizes para a Qualidade no Gerenciamento de Projetos, Associação Brasileira de Normas Técnicas, Rio de Janeiro, RJ, Brasil**, [S.l.], 2000.

ISO, N. ISO/IEC/IEEE 16326:2009(en) systems and software engineering – life cycle processes – project management, guide for the application of iso/iec 12207 to project management. **International Organization for Standardization, 2009**, [S.l.], 2009. `https:www.iso.org/obp/ui/iso:std:iso-iec-ieee:16326:ed-1:v1:en`.

JAAFARI, A. Project and program diagnostics: a systemic approach. **International Journal of Project Management**, [S.l.], v.25, n.8, p.781–790, 2007.

JUGDEV, K.; MÜLLER, R. A retrospective look at our evolving understanding of project success. **Project management journal**, [S.l.], v.36, n.4, p.19–31, 2005.

KERZNER, H. R. **Project management**: a systems approach to planning, scheduling, and controlling. [S.l.]: John Wiley & Sons, 2013. 10th. ed. New Jersey, NJ, USA.

KITCHENHAM, B. Procedures for performing systematic reviews. **Keele, UK, Keele University**, [S.l.], v.33, p.2004, 2004.

KITCHENHAM, B. **Guidelines for performing systematic literature reviews in software engineering**. [S.l.]: Technical report, EBSE Technical Report EBSE-2007-01, Keele University, 2007.

KLAFF, O. **Pitch Anything**: an innovative method for presenting, persuading and winning the deal. [S.l.]: McGraw-Hill, 2011.

KRUCHTEN, P. **The rational unified process**: an introduction. [S.l.]: Addison-Wesley Professional, 2004.

LALONDE, P.-L.; BOURGAULT, M.; FINDELI, A. An empirical investigation of the project situation: pm practice as an inquiry process. **International Journal of Project Management**, [S.l.], v.30, n.4, p.418–431, 2012.

LAU, F. Toward a framework for action research in information systems studies. **Information Technology & People**, [S.l.], v.12, n.2, p.148–176, 1999.

LOUIS, C.; LAWRENCE, M.; KEITH, M. Research methods in education. **New York: Routledge**, [S.l.], 2007.

LUNDIN, R. A.; SÖDERHOLM, A. Conceptualizing a projectified society discussion of an eco-institutional approach to a theory on temporary organisations. In: **Projects as arenas for renewal and learning processes**. [S.l.]: Springer, 1998. p.13–23.

LYYTINEN, K.; ROSE, G. M. Information system development agility as organizational learning. **European Journal of Information Systems**, [S.l.], v.15, n.2, p.183–199, 2006.

MAANINEN-OLSSON, E.; MÜLLERN, T. A contextual understanding of projects - The importance of space and time. **Scandinavian Journal of Management**, [S.l.], v.25, n.3, p.327–339, 2009.

MACKENZIE, N.; KNIPE, S. Research dilemmas: paradigms, methods and methodology. **Issues in educational research**, [S.l.], v.16, n.2, p.193–205, 2006.

MAFRA, S. N.; TRAVASSOS, G. H. Estudos Primários e Secundários apoiando a busca por Evidência em Engenharia de Software. **Relatório Técnico: RT-ES-687/06–Programa de Engenharia de Sistemas e Computação-COPPE/UFRJ–Rio de Janeiro**, [S.l.], 2006.

MANIFESTO, C. Think Big, Act Small. **The Standish Group International Inc**, [S.l.], 2013.

MARCONI, M. d. A.; LAKATOS, E. M. **Metodologia científica**. [S.l.]: Atlas, 2000.

MARSHALL, C.; ROSSMAN, G. B. **Designing qualitative research**. [S.l.]: Sage publications, 2010.

MASON, J. **Qualitative researching**. [S.l.]: Sage, 2002.

MENGEL, T.; THOMAS, J. From Know-How-To-Know Why, A three dimensional model of Project Management Knowledge. **PMI Global Proceeding**, [S.l.], 2004.

MEREDITH, J. R.; MANTEL JR, S. J. **Project management**: a managerial approach. [S.l.]: John Wiley & Sons, 2011.

MORRISON, J.; BROWN, C. Project management effectiveness as a construct: a conceptual study. **S. Afr. J. Bus. Manage**, [S.l.], v.35, n.4, p.73–94, 2004.

MOURA, H. **Software Project Framework**: the framework. `http://www.cin.ufpe.br/hermano/spf/`accessed in Feb 21th 2015.

MURRAY, A. et al. **Managing successful projects with PRINCE2**. [S.l.]: TSO (The Stationary Office), 2009.

OHARA, S. **P2M**: a guidebook of project & program management. [S.l.]: Project Management Association of Japan, 2005.

OHARA, S.; ASADA, T. **Japanese project management**: kpm-innovation, development and improvement. [S.l.]: World Scientific, 2009. v.3.

PACKENDORFF, J. Inquiring into the temporary organization: new directions for project management research. **Scandinavian journal of management**, [S.l.], v.11, n.4, p.319–333, 1995.

PATTON, M. Q. **Qualitative research**. [S.l.]: Wiley Online Library, 2005.

PAULK, M. C. et al. **The capability maturity model**: guidelines for improving the software process. [S.l.]: Addison-wesley Reading, MA, 1994. v.441.

PEDLER, M.; ABBOTT, C. Am I doing it right? Facilitating action learning for service improvement. **Leadership in Health Services**, [S.l.], v.21, n.3, p.185–199, 2008.

PEDLER, M.; ABBOTT, C. Lean and learning: action learning for service improvement. **Leadership in Health Services**, [S.l.], v.21, n.2, p.87–98, 2008.

PETTICREW, M.; ROBERTS, H. **Systematic reviews in the social sciences**: a practical guide. [S.l.]: John Wiley & Sons, 2008.

PFLEEGER, S. L. Albert Einstein and empirical software engineering. **Computer**, [S.l.], v.32, n.10, p.32–38, 1999.

PINTO, J. K.; SLEVIN, D. P. Project success: definitions and measurement techniques. In: **Anais...** [S.l.: s.n.], 1998. v.19, n.3, p.67–73.

PMI. Organizational Project Management Maturity Model Knowledge Foundation: opm3. **Project Management Institute, Newtown Square Pennsylvania, USA**, [S.l.], 2003.

PMI. Guide to the project Management body of knowledge: pmbok guide. **Project Management Institute, Newtown Square Pennsylvania, USA**, [S.l.], 2008.

PMI. Pulse of the profession: the high cost of low performance. **Project Management Institute, Newtown Square Pennsylvania, USA**, [S.l.], 2013.

PMI. Project Management Talent Gap Report. Industry growth Forecast. Project Management between 2010 and 2020. **Project Management Institute, Newtown Square Pennsylvania, USA**, [S.l.], 2013.

POLIT, D. F.; HUNGLER, B. P. Fundamentos de pesquisa em enfermagem. In: **Fundamentos de pesquisa em enfermagem**. [S.l.]: Artes Médicas, 1995.

POLLACK, J.; COSTELLO, K.; SANKARAN, S. Applying Actor–Network Theory as a sensemaking framework for complex organisational change programs. **International Journal of Project Management**, [S.l.], v.31, n.8, p.1118–1128, 2013.

POPPENDIECK, M.; POPPENDIECK, T. **Lean software development**: an agile toolkit. [S.l.]: Addison-Wesley Professional, 2003.

POPPENDIECK, M.; POPPENDIECK, T. **Implementing lean software development**: from concept to cash. [S.l.]: Pearson Education, 2007.

POUNDER, T. Using action learning to drive organizational learning and performance. **Strategic HR Review**, [S.l.], v.8, n.3, p.17–23, 2009.

PWC. **Idéias e tendências**: práticas atuais de gestão de projetos, portfólios e programas. terceira pesquisa global sobre a gestão de projetos. `http://www.pwc.com.br/pt_BR/br/publicacoes/servicos/assets/consultorianegocios/insights-and-trends-12.pdf`.

RAELIN, J. A. "I don't have time to think!" versus the art of reflective practice. **Reflections**, [S.l.], v.4, n.1, p.66–79, 2002.

RAGIN, C. C.; AMOROSO, L. M. **Constructing social research**: the unity and diversity of method. [S.l.]: SAGE Publications, 2010.

RANDOLPH, J. J. A guide to writing the dissertation literature review. **Practical Assessment, Research & Evaluation**, [S.l.], v.14, n.13, p.2, 2009.

REINEHR, S. D. S. **Reuso sistematizado de software e linhas de produto de software no setor financeiro**: estudos de caso no brasil. 2008. Tese (Doutorado em Engenharia) – Escola Politécnica da USP.

ROBINSON, H.; SEGAL, J.; SHARP, H. Ethnographically-informed empirical studies of software practice. **Information and Software Technology**, [S.l.], v.49, n.6, p.540–551, 2007.

ROSELINO, J. E. **A industria de software**: o modelo brasileiro em perspectiva comparada. 2006. Tese (Doutorado em Ciência da Computação) — UNIVERSIDADE ESTADUAL DE CAMPINAS.

SAGE, D.; DAINTY, A.; BROOKES, N. A consideration of reflexive practice within the critical projects movement. **International journal of project management**, [S.l.], v.28, n.6, p.539–546, 2010.

SAMPAIO, S. et al. Reflecting, adapting and learning in small software organizations: an action research approach. **International Conference on Software Engineering and Knowledge Engineering**, [S.l.], 2015.

SAMPAIO, S.; MARINHO, M.; MOURA, H. An Approach to Understanding Project Actuality in Small Software Development Organizations and Contribute to Their Success. **Procedia Technology**, [S.l.], v.16, n.0, p.1146 – 1154, 2014. {CENTERIS} 2014 - Conference on {ENTERprise} Information Systems / ProjMAN 2014 - International Conference on Project {MANagement} / {HCIST} 2014 - International Conference on Health and Social Care Information Systems and Technologies.

SAMPAIO, S.; MARINHO, M.; MOURA, H. Systematic Review on Project Actuality. **International Journal of Software Engineering & Applications**, [S.l.], v.5, n.6, p.51–63, 2014.

SAMPAIO, S.; MARINHO, M.; MOURA, H. Understanding Project Management Actuality in Small Software Development Organizations. **International Conference on Information System and technology Management**, [S.l.], 2015.

SAMPAIO, S.; MOURA, H. **Towards understanding project actuality in small software development organizations**. Available at `http://sbqs2014.inf.furb.br/downloads/Anais/WTDQS2014.pdf`.

SANTOS, G. et al. Using a Software Development Environment with Knowledge Management to Support Deploying Software Processes in Small and Medium Size Companies. In: WISSENSMANAGEMENT. **Anais...** [S.l.: s.n.], 2005. p.72–76.

SANTOS, G. et al. Implementing software process improvement initiatives in small and medium-size enterprises in Brazil. In: QUALITY OF INFORMATION AND COMMUNICATIONS TECHNOLOGY, 2007. QUATIC 2007. 6TH INTERNATIONAL CONFERENCE ON THE. **Anais...** [S.l.: s.n.], 2007. p.187–198.

SANTOS, G.; WEBER, K. C.; ROCHA, A. R. C. da. Software Process Improvement in Brazil: evolving the mps model and consolidating the mps. br program. In: XXXV LATIN AMERICAN INFORMATICS CONFERENCE, PELOTAS, RS, BRAZIL. **Anais...** [S.l.: s.n.], 2009.

SARFATI, G. Estágios de desenvolvimento econômico e políticas públicas de empreendedorismo e de micro, pequenas e médias empresas (MPMEs) em perspectiva comparada: os casos do brasil, do canadá, do chile, da irlanda e da itália. **Revista de Administração Pública**, [S.l.], v.47, n.01, p.25–48, 2013.

SAUER, C.; REICH, B. H. Rethinking IT project management: evidence of a new mindset and its implications. **International Journal of Project Management**, [S.l.], v.27, n.2, p.182–193, 2009.

SCHENSUL, S. L. **Essential ethnographic methods**: observations, interviews, and questionnaires. [S.l.]: Rowman Altamira, 1999. v.2.

SCHÖN, D. A. **The reflective practitioner**: how professionals think in action. [S.l.]: Basic books, 1983. v.5126.

SCHUETZENMEISTER, F. University research management: an exploratory literature review. **Institute of European Studies**, [S.l.], 2010.

SCHWABER, K. **Agile project management with Scrum**. [S.l.]: Microsoft press Redmond, 2004. v.7.

SEAMAN, C. B. Qualitative methods in empirical studies of software engineering. **Software Engineering, IEEE Transactions on**, [S.l.], v.25, n.4, p.557–572, 1999.

SEBRAE. **Anuário do trabalho na micro e pequena empresa**: 2010-2011. Brasilia – DF: Serviço Brasileiro de Apoio às Micro e Pequenas Empresas, 2011.

SEGAL, J. When Software Engineers Met Research Scientists: a case study. **Empirical Software Engineering**, [S.l.], v.10, n.4, p.517–536, 2005.

SENGE, P. M.; SUZUKI, J. **The fifth discipline**: the art and practice of the learning organization. [S.l.]: Currency Doubleday New York, 1994.

SHENHAR, A. J. et al. Project success: a multidimensional strategic concept. **Long range planning**, [S.l.], v.34, n.6, p.699–725, 2001.

SIANG, L. F.; YIH, C. H. A Comparative Approach of Japanese Project Management in Construction, Manufacturing and IT Industries. **Procedia-Social and Behavioral Sciences**, [S.l.], v.57, p.193–200, 2012.

SIMMONS, D. B. Software Organization Productivity. **Software Productivity Improvement Laboratory, Department of Computer Science Texas A & M University**, [S.l.], 2007.

SMITH, P. A. Action learning and reflective practice in project environments that are related to leadership development. **Management Learning**, [S.l.], v.32, n.1, p.31–48, 2001.

SOFTEX. **MPS.BR Guia Geral 2012**. 2012.

STAPLES, M.; NIAZI, M. Systematic review of organizational motivations for adopting CMM-based SPI. **Information and software technology**, [S.l.], v.50, n.7, p.605–620, 2008.

SUGIMORI, Y. et al. Toyota production system and kanban system materialization of just-in-time and respect-for-human system. **The International Journal of Production Research**, [S.l.], v.15, n.6, p.553–564, 1977.

SUPPLEMENTARY law 123/06. `http://www.receita.fazenda.gov.br/Legislacao/LeisComplementares/2006/leicp123.htm` accessed in Jan, 18th 2015.

THIOLLENT, M. Metodologia da pesquisa-ação. In: **Metodologia da pesquisa-ação**. [S.l.]: Cortez, 2011.

TURNER, J. Evolution of project management research as evidenced by papers published in the International Journal of Project Management. **International Journal of Project Management**, [S.l.], v.28, n.1, p.1–6, 2010.

TURNER, J. R.; MÜLLER, R. On the nature of the project as a temporary organization. **International Journal of Project Management**, [S.l.], v.21, n.1, p.1–8, 2003.

WEBER, K. C. et al. Brazilian software process reference model and assessment method. In: **Computer and Information Sciences-ISCIS 2005**. [S.l.]: Springer, 2005. p.402–411.

WILDING, P. M. Reflective practice: a learning tool for student nurses. **British Journal of Nursing**, [S.l.], v.17, n.11, p.720–800, 2008.

WILLIAMS, T. et al. An investigation of governance frameworks for public projects in Norway and the UK. **International Journal of Project Management**, [S.l.], v.28, n.1, p.40–50, 2010.

WINTER, M. et al. Directions for future research in project management: the main findings of a uk government funded research network. **International journal of project management**, [S.l.], v.24, n.8, p.638–649, 2006.

WINTER, M.; SZCZEPANEK, T. **Images of projects**. [S.l.]: Gower Publishing, Ltd., 2009.

YIN, R. K. **Estudo de caso**: planejamento e métodos. [S.l.]: Porto Alegre: Bookman, 2005.

YIN, R. K. **Case study research**: design and methods. [S.l.]: Sage publications, 2014.

ZELKOWITZ, M. V.; WALLACE, D. Experimental validation in software engineering. **Information and Software Technology**, [S.l.], v.39, n.11, p.735–743, 1997.

Appendix

A

Carta Convite

Carta Convite

Centro de Informática
Universidade Federal de Pernambuco
Recife, Brasil

Universidade Federal de Pernambuco
Centro de Informática
Av. Jornalista Anibal Fernandes
Recife, Pernambuco, Brasil
CEP 50732-970
Fone +55 81 2126.8430 (ramal 4314)
Fax +55 81 2126.8438
hermano@cin.ufpe.br

Recife, 2 de Fevereiro de 2015

Um convite para participar em um *estudo de campo* sobre os fenômenos relacionados a realidade em projetos de software. Termo dado ao estudo da experiência vivida pelos integrantes de uma equipe de desenvolvimento, o que de fato ocorre no ambiente de projeto.

Investigadores principais:

Dr. Hermano Perrelli de Moura, Professor
Centro de Informática (CIn), Universidade Federal de Pernambuco (UFPE).

Suzana Cândido de Barros Sampaio, estudante da UFPE/ CIn, candidato ao grau de Doutorado em Ciência da Computação.

1 Objetivo

Este estudo, iniciado em 2011, no Centro de Informática (CIn) da Universidade Federal de Pernambuco (UFPE) está realizando uma pesquisa com objetivo de obter uma melhor compreensão da realidade em projetos de software, com foco na experiência vivida, na qualidade da interação social, identidade, e do relacionamento entre agentes e estrutura em ambientes de projeto.

Para este fim será adotada em um primeiro momento a etnografia[1], uma forma de pesquisa com foco no campo da sociologia através da observação, somado a entrevistas e análise documental. No segundo momento será adotado a Pesquisação[2], para planejar e conduzir intervenções transformadoras no campo de pesquisa, projetos e times de desenvolvimento de software. Permitindo que ações possam emergir do processo investigatório para resolução de problemas observados.

Estamos convidando sua organização a participar de um estudo de campo sobre realidade em projetos/times de desenvolvimento de software, onde o investigador estará nas suas instalações, para conduzir observações, entrevistas e análise de documentos.

---

[1] Para a engenharia de software, a etnografia pode ajudar a compreender como as comunidades técnicas constroem uma cultura de práticas e estratégias de comunicação que lhes permite realizar um trabalho técnico de forma colaborativa [Easterbrook, 2008].

2 Etnografia é a descrição científica de costumes individuais e da cultura de pessoas ou grupos (http://www.oxforddictionaries.com/). O processo de interação, cujo objetivo se estende ao entendimento entre os participantes capaz de provocar mudanças na realidade e nos próprios sujeitos [Maciel, 1999, p.35].

2 Procedimento do Estudo

Para realizar a coleta dos dados, o pesquisador irá requerer acesso aos membros do time, mas não estará ativamente engajado com o time ou participando dos projetos em andamento. Não sendo necessário um ambiente exclusivo para o pesquisador ou recursos computacionais.

Técnicas adotadas

Os dados do estudo serão coletados usando os seguintes mecanismos ou técnicas:

1. **Observação dos participantes**: o investigador deverá adotar uma abordagem "*fly on the wall*" para observar as atividades diárias do time, além de acompanhar reuniões de planejamento e técnicas do time.
2. **Entrevistas semiestruturadas:** Alguns membros do time em observação serão convidados a participar de entrevistas. Uma entrevista irá requerer aproximadamente uma hora do tempo do participante, podendo se repetir ao longo do estudo.
3. **Análise de documentos:** Com permissão de sua organização, o pesquisador irá coletar e analisar documentos considerados relevantes para o estudo. Isso irá incluir documentos formais e memorandos relacionados aos fenômenos em estudo, bem como e amostras de produtos de trabalho (artefatos) dos processos relacionados.
4. **Entrevistas participativas:** onde o pesquisador vai envolver os integrantes da equipe na reflexão sobre um problema que ações possam emergir desta discussão.

Procedimentos

Todos os integrantes da equipe devem ser informados que o investigador vai transitar pela organização. O coordenador do site, na pessoa de **Aurélio Barboza** ficará responsável por esta comunicação. Sendo necessário, o pesquisador fará uma breve apresentação para o time e descrever o estudo. O trabalho deve durar até 3 meses, podendo se estender caso ambas as partes concordem.

Nos primeiros dias o pesquisador deverá apenas observar a organização, os times e identificar papéis no time e iniciar a seleção para o processo de entrevistas. O pesquisador irá solicitar aos membros da equipe que apresentem ou descrevam os processos, procedimentos e atividades relacionadas ao desempenho de suas funções.

Um cronograma apropriado para a pesquisa deve ser negociado com o time. Este cronograma inclui agendamento de sessões de observação (por exemplo, dois dias por semana).

Durante a coleta de dados, o pesquisador irá requerer algum tempo dos membros do time para atividades, que pode incluir o planejamento das seções de observação, planejamento de entrevistas, e a solicitação de assistência para seleção de documentos relevantes.

Compartilhamento e validação das observações

O pesquisador irá compartilhar um resumo de suas observações com a organização para:

- Prover uma oportunidade para organização comentar e validar as observações;
- Compartilhar as observações com a organização; e
- Apoiar na reflexão e desenho das ações para evolução da organização.

3 Confidencialidade

Ninguém, além dos pesquisadores nomeados, terá acesso aos dados brutos recolhidos por este instrumento: notas de campo, transcrições de entrevistas, documentação dos projetos, etc. O resultado do estudo será apresentado apenas como um resumo dos dados coletados. Nenhuma informação de identificação pessoal ou da organização será relatada.

Os pesquisadores devem ainda fornecer visibilidade dos achados ao longo da pesquisa para a organização.

4 Remuneração / Compensação

Nenhuma compensação deverá ser fornecida a participação neste estudo.

5 Benefícios

Não se pretende identificar neste estudo, ineficiências específicas na organização em observação. Contudo, um resumo das observações que será apresentado à organização pode ajudá-la a identificar e tratar pontos de melhoria. Estas informações podem ser úteis para melhorar o desempenho da organização e seus projetos.

Além disso, a etapa de pesquisação com entrevistas participativas serão realizadas trarão reflexão e possíveis melhorias identificadas pela própria equipe da organização.

6 Contato para informações sobre o estudo

Caso possua alguma dúvida ou deseje mais informações com relação a este estudo, contatar a pesquisadora, Suzana Sampaio (scbs2@cin.ufpe.br ou suzana.sampaio@gmail.com). Ou ainda, para dúvidas sobre direitos como participante da pesquisa, contatar a Secretaria da Diretoria de Pesquisa (SEC-DPQ) da Pró-reitoria para assunto de Pesquisa e Pós-graduação da UFPE (PROPESQ) no telefone +55 (81) 2126-7041 ou por email: dpq.propesq@ufpe.br.

7 Consentimento

A sua participação neste estudo é totalmente voluntária e você pode se recusar a participar ou retirar sua organização do estudo a qualquer momento. A sua assinatura abaixo indica que você concorda e apoia o presente estudo em nome de sua organização, bem como materializa a permissão de sua organização para o pesquisador trabalhar in loco durante o estudo.

A assinatura do pesquisador reforça o comprometimento com os termos aqui apresentados.

_____

Assinatura do pesquisador, Data

Suzana Cândido de Barros Sampaio

(CPF XXXX)

_____

Assinatura do participante, Data

Nome do Responsável na Empresa

Organização: **Nome da Organização**

Email: email do representante da organização

B

Research Plan

Plano de Pesquisa de Campo

Nome da Organização <Nome da Organização>

Pesquisador:

Representante da Organização: <Nome>

Versão	Data	Responsável	Descrição
01.00	xx.xx.xx		Versão Inicial

Conteúdo

1. Objetivo

O objetivo deste plano é documentar o planejamento macro da pesquisa de campo para a empresa <Nome da Empresa>. A pesquisa tem como objetivo macro entender a realidade de projetos e apoiar as empresas na reflexão e com isso melhoria de seus resultados. Este plano apenas cita os pontos macros, e deve ser incrementado ao longo da pesquisa.

2. Envolvidos (Stakeholders) do Projeto

2.1 Organograma

Descrever aqui o organograma organizacional, ou dos times de trabalho quando pertinente.

2.2 Time de trabalho e interessados

Papel	Membro	Responsabilidades

OBS: Incluir o papel percebido, não o comentado ao longo das observações iniciais.

3. Projetos/Time do Escopo da pesquisa

<Caso não exista o conceito de projeto, identificar a operação e dados da operação. Adaptando as subseções abaixo.>

3.1 Nome do Projeto

O projeto será realizado em um período de X semanas, cerca de Y dias trabalhados. A equipe se reúne nas <incluir os dias das reuniões>. Se possível incluir os marcos do projeto nesta seção.

3.2 Nome do Projeto

O projeto será realizado em um período de X semanas, cerca de Y dias trabalhados. A equipe se reúne nas <incluir os dias das reuniões>.

4. Script da Observação

<Como não temos um padrão para estudos etnográficos, os principais passos devem ser documentados aqui. Os passos abaixo se baseiam na experiência desta própria pesquisa, mas devem ser adaptados de acordo com cada estudo.>

Os principais passos de investigação serão:

Passo	Envolvidos	Agenda
Reunião com a Diretoria		Visita 1
Visita as instalações		Visita 1 ou 2

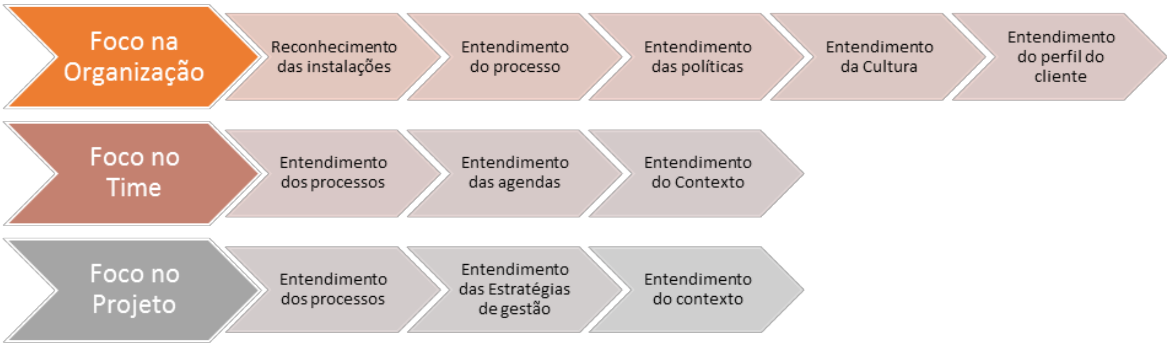
Análise de processos, ferramentas ou documentações organizacionais		Visita 3
Visita a gerência imediata para visibilidade de projetos ou operações em andamento		Visita 3
Reconhecimento do ambiente de trabalho dos times		Visita 4
Fechamento da Amostra		Visita 5
Reconhecimento da rotina e horários dos times		Visita 6
Execução das Observações dos Times		Visita 7-n
Execução das observações dos projetos e leitura da documentação de apoio		Visita N+1 - S
Intervenção através de pesquisação		Visita S+1 – Final
Apresentação dos resultados preliminares		Final

5. Agenda das visitas

<Estabelecer uma agenda mínima de visitas, um dia ou turnos semanais de visita. Idealmente cubra as reuniões e principais marcos do projeto. Qualquer limitação da organização, como recesso, feriados locais e afins devem ser documentados. Não há um dia previsto para o término das visitas, quando o pesquisador conseguir informações suficientes na observação pode passar para a intervenção e quando a reflexão e o aprendizado estiverem na rotina da organização, está na hora de concluir o projeto de pesquisa. >.

A organização, seus Time/Projeto serão visitados todo <dia da semana>, com duração de visitas de <número de horas>. Novas visitas podem ser incluídas para se adequar ao cronograma da equipe/projeto.

6. Visão macro das etapas para visibilidade das equipes



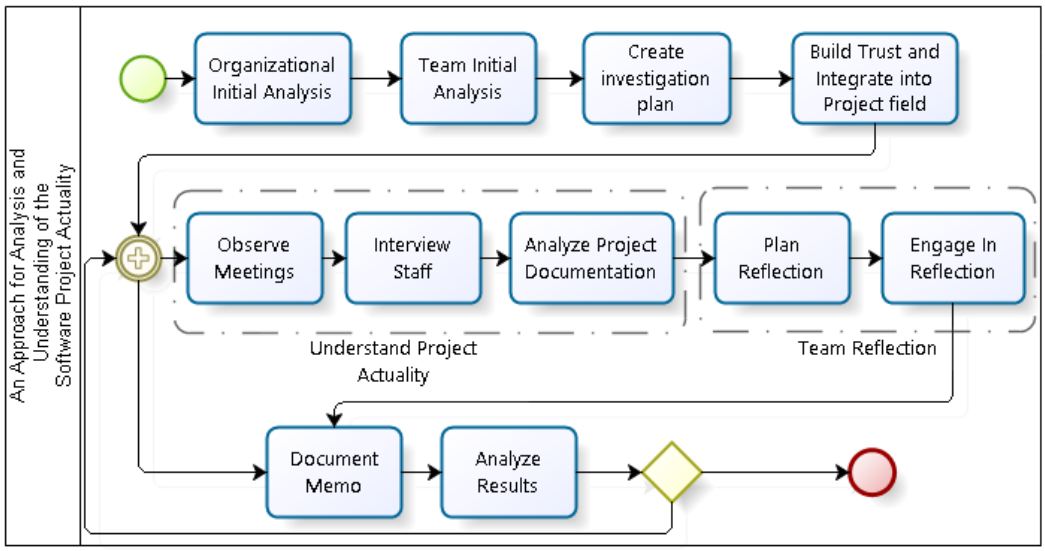
C

The Approach Modeled with Bizagi

An Approach for Analysis and Understanding of the Software Project Actuality

Table of Contents

1 The Approach Diagram



Powered by bizagi Modeler

Version: 4.1;

Author: Suzana Sampaio

2 An Approach for Analysis and Understanding of the Software Project Actuality: The content.

2.1 Organizational Initial Analysis

Description

Goal: Analyze organization, its clients, goals, areas of interest, organization chart, products and process.

Start Criteria: Organization´s understanding of the research goal and the wiliness to engage in the research activity.

Income:

- Contact with organization´s leader or project manager.
- Invitation letter prepared (Appendix A) or signed.

Exit Criteria: Organization's preliminary understanding created.

Steps:

- Schedule a conversation with organization´s high level management;
- Establish or reinforce a non-disclosure agreement;
    - If the invitation letter is not yet signed, both parties must sign it in this moment;
    - The reinforcement is necessary if this step was previously accomplished. This step will allow the organization to feel less uncomfortable with sharing information, documents and opening their door to the research.
- Meet with them and elicit organizations goals, products, perceived problems and interests;
- Understand their clients profile;
- Draft organization's profile in order to help in the research plan elaboration;
- Ask for organization chart, roles description, formal and informal organization;
- Ask for permission to observe and talk to their staff, at least the leaders must be involved in a quick conversation;
- Collect data such as:
    - What are the Teams, their objectives and their relevance to the organization?
    - What problems concerns their project or themselves?
    - What are the conflicts they deal with nowadays?
- Investigate and stimulate talking.
- Do installations recognition and document it

Outcomes:

- Organization's preliminary understanding;
- Roles and contact inside projects;
- Minutes in case of meetings;
- Non-disclosure agreement.

OBS: This cycle of understanding might take more than one visit. The importance is to gather enough information to plan the research, visitations and ethnographic studies.

Adaptation tips: If the researcher is going to be someone from inside the organization, this step may be suppressed.

Performers: Researcher

2.2 Team Initial Analysis

Description

Goal: Analyze team(s), how the communication flows, what is their agenda, their roles, motivations and leaders.

Start Criteria: Initial understanding of the organizational scenario and context.

Income:

- Organization's preliminary understanding;
- Roles and contacts from project and team members;
- Minutes in case of meetings;
- Non-disclosure agreement

Exit Criteria: Teams' preliminary understanding created.

Steps:

- Analyze team's process and understand it;
- Collect information about team's agenda;
- Start the team's context understanding;
- Collect the following data:
    - Name, Team role, Team name, time in the organization.
    - What is their identification and profile?
    - What are their activities? When does it begin?
    - What are the conflicts they deal with nowadays?
    - What do they do when they come?

- Collect team's formal and informal agenda;
- Investigate and stimulate talking.

Outcomes:

- Organization's preliminary understanding and teams' preliminary findings;
- Minutes in case of meetings

Observation:

- This cycle of understanding might take more than one visit. The importance is to gather enough information to choose relevant teams and to refine investigation plan.

Adaptation tips:

- If there is just one team, then this step can be combined with organizational initial analysis.

Performers: Researcher

2.3 Create investigation plan

Description

Goal: Create and establish an investigation plan, contemplating teams (or areas) formal and informal agenda.

Income:

- Organization's preliminary understanding and teams' preliminary findings;
- Roles and contact inside projects;
- Non-disclosure agreement;
- Minutes in case of meetings.

Exit Criteria: Plan created and approved by organization´s sponsor.

Steps:

- Define the sample, what teams/project will be observed;
- Narrow the research objective or scope;
- For each project or area to be analyze, identify team, routines, times and schedules. The goal is to have more than one project in the sample, to be observed through it entire life cycle;
- Document teams agenda as weekly research schedule (every meeting is an appointment for observation);
- Plan visits to contemplate observing teams agenda as weekly research schedule;
- Every field event must be considered, formal an informal;
- That means to plan the research agenda according to team's agenda, contemplating formal and informal communication moments.
- Establish the plan. The plan template can be seen in Portuguese in the Appendix B;
- Get sponsor´s agreement on the plan.
    - As researcher, and in order to analyze team's actuality and project actuality, you must let people know you are going to be around. Formal or informal agreement on the plan is very useful.

Outcomes: Investigation plan approved.

Obs: NA.

Adaptation Tips: The plan is important to narrow the research objective. This step is mandatory regardless if the person is an outsider research or an internal one.

Performers: Researcher

2.4 Build Trust and Integrate into Project field

Description

Goal:

- Researcher's integration into the observation field [Patton, 2002];
- Build trust and familiarity, which make it safe for people to approach researchers and participate in the study.

Income:

- Investigation plan approved.

Exit Criteria:

- Researcher aware of project and team dynamics;
- No different treatment to the researcher once he gets in;
- Researcher able to blend as similar (as much as possible).
    - If you can not tell the difference if you are trusted or not, at least make sure people are not treating you different from anybody else.

Steps:

- Ask project manager or project leader or scrum master to briefly explain what you are doing in the meetings and at the organization. Or informally, explain what is the goal of the study for team members, if the opportunity comes;
- Arrive long before the scheduled time (Lalonde et al.,20010);
- Maintain a regular visitation schedule at field sites. Even if you are not able to or not planning to collect data during those moments;
    - By simply being on site, even if not explicitly engaged in data collection, helps to build trust and familiarity, which makes it safe for people to approach us and participate in the study (Adolph et al, 2011).
    - Regular visitation schedule develops trust, such that will encourage people to approach you and offer their story.
- Engage in informal conversations.
    - Meet people;
    - Drink Coffee;
    - Have lunch with team members. Informal conversation are very useful to integrate in the field.
- Show the intention, make it clear that all the findings will not have any attribution;
- Listen to them;
- Informally analyze conflicts, problems, singularities, and fortresses;
- Document findings. Always take notes, the quote spoken, the actor involved, the situation it came out and context it occurred;
- Invite them on engaging as researchers;
- Refine intervention plan.

Outcomes:

- Familiarity with team and field;
- Project initial understanding and team trust gained;

- Research plan refined;
    - The plan must be always refined to maintain coherency to project actuality. Although there is no predefined amount of hours. The idea is to get involved, to get to know people. This moment must be seen as a pilot for understanding project actuality.
- Researcher integrated with project field.

Obs:

- Although the plan is very important, it is not useful at this moment. You are an outsider and until this premise does not change you will not be able to blend as similar;
- There is no pre-defined amount of hours for this activity. The idea is to get involved and gain trust. A procedural and systemic approach allows researchers to get adequate and trustworthy answers to their questions (Maaninen-Olsson and Mullern, 2009);
- The question in this moment is not a matter of time, but a matter of been trusted or not. Once you get in, if everyone feels uncomfortable, probably are not acting like themselves.

Adaptation tips: Even though the organization member is not an outsider, he must make sure that colleagues know about his intention and make sure he is not seen as a policy or inspector

Performers: Researcher

2.5 Observe Meetings

Description

Goal:

- Observe project context and begin to understand project actuality. Observation enables you to see how people actually conduct their lives versus how they say they conduct their lives (Adolph et al., 2011);
- Identify conflicts, problems, singularities and fortresses;
- Understand more clearly the context of the project and thereby get a more comprehensive view of the various challenges confronting the managing of projects in practice (Maaninen-Olsson and Mullern, 2009).

Income:

- Familiarity with team and field;
- Project initial understanding and team trust gained;
- Research plan refined;
- Researcher integrated with project field.

Exit Criteria:

- Several Meetings observation, conversations observations, problem-solving or discussed observation. Cultural, motivation, context, causalities and actuality aspects identified;
- Communication and "power" map identified;
    - Identify how communication flow works. It will help the overall analysis;
- Problem backlog, as associated causalities documented.

Steps:

- Attended a number of different project meetings (Lalonde et al, 2010). If it is possible, attend to all meetings;
    - Observe project meetings, at customer meetings and at various functional meetings (Maaninen-Olsson and Mullern, 2009);

    - Researches are interested in unusual things and activities rather than "universal" elements of perceived "good practice" (Cicmil, 2006).
- Look at participants in real workplaces (Avram, 2008);
- Participating overly or covertly in people's daily lives for an extended period of time, watching what happens, listening to what is said, gathering whatever data are available to throw light on the issues that are the emerging focus of inquiry (Hammersley and Atkinson, 2007);
- Follow the project over time, and thereby to study the different spatial and temporal challenges as they occurred (Maaninen-Olsson and Mullern, 2009);
- Be primarily concerned with ''what is going on'' and try to understand ''why it happens'' (Maaninen-Olsson and Mullern, 2009);
- Investigate social and cultural patterns and meaning (Schensul, 1999). Discover what really goes on in particular technical communities, and for revealing subtle but important aspects of work practices (Easterbrook et al., 2008);
- Study real work circumstances (Avram,2008);
- Capture the discourse of actors who are working on projects and examine the ways in which these actors enter into, question and act on project situations (Lalonde, 2010);
- Study people and do not ignore personal values because personal values influence the ways people interpret reality (Adolph, 2011);
- Observe informal discussions in order to ensure a fundamental familiarity with the context of the project. (Maaninen-Olsson and Mullern, 2009);
- Collect data using participant observation, which allowed us to observe what people did (Adolph et al., 2011);
- Look very closely (Genzuk, 2003). Make sure that every theme is covered by various kinds of observations (Maaninen-Olsson and Mullern, 2009);
- Elaborate a problem backlog with conflicts, problems, singularities and wastes.
- Understand how people manage their lives in the context of a problematic situation and how people understand and deal with what is happening to them through time and changing circumstances (Schreiber and Stern , 2001);

Obs: The above steps must continue until the information saturates. That means much more of the same has been observed and nothing new is coming.

Outcomes:

- Notes, tapes, discourse, context, circumstance, situation, actions and problems documented;
- Project or team's analysis;
- Doubts or inconsistencies to elucidate in interviews;
- Problem Backlog.

Adaptation tips:

- The observation for an organization employee must narrow the scope to be analyzed. Most of the steps are tips to be successful in this task. Try to give another look for the daily routine and conversations around you. This activity is mandatory.

Performers: Researcher

2.6 Interview Staff

Description

Goal:

- Identifying recurrent patterns that cut through the different individual stories in the interviews;
- Assess the knowledge. Respondents are seen as repositories of knowledge about their reality (Cicmil, 2006).

Income:

- Investigation plan;
- Specific doubts or inconsistency observed to be clarified;
- Previous Notes, tapes, memos, discourse, context, circumstance, situation, actions and problems documented.
- Problem Backlog.

Exit Criteria: Data and knowledge extracted from interviews.

Steps:

- Collect data using semi-structured interviews (Adolph et al., 2011), (Segal, 2005), (Sauer and Reich, 2008), (Maaninen-Olsson and Mullern, 2009), (Williams, 2010);
    - One question that becomes quite important during the interview is asking "why?" (Adolph et al., 2011);
    - Document contextual changes that were affecting them, ask how is it affecting their roles, the management practices (Sauer and Reich, 2008).

- If consented, record interview for future transcription (Maaninen-Olsson and Mullern, 2009), (Avram,2008), (Adolph et al., 2011), (Cicmil,2006);
- Interviews must take place on actual project sites allowing the researchers to observe project managers in action (Cicmil, 2006);
- Repeated interviews with respondents, it serves to validate themes as they emerged (Maaninen-Olsson and Mullern, 2009);
- Conduct informal interviews with the actors (Lalonde et al, 2010);
    - Informal interviews should be considered complimentary;
    - Interviewed the team manager, developers, department managers, project participants from the focal organization and consultants.
- Revise problem backlog with new problems, issues and its causalities.

Outcomes:

- Notes, tapes, discourse, context, circumstance, situation, windows, recurrent patterns, actions, problems and causalities documented.

Adaptation tips: All information must be crossed. Doubts must be elucidated and confirmed. Maybe, this must be the most difficult task, since colleagues cannot take it seriously. However, chose the right interviewees that will really enrich your research and project analysis.

Performers: Researcher

2.7 Analyze Project Documentation

Description

Goal: Analyze project documentation

Income:

- Company and project documentation collected.

Exit Criteria: Documentations analyzed.

Steps:

- Study the documents in the project repository;
- Collected data from many sources;
- Make sure that every theme is covered by various kinds of written material;
- Cross analysis with data collected. Look for inconsistency or reinforcements for your findings;
- If you are analyzing projects metrics, results, client feedback, variation of budget, scope and schedule must be analyzed in order to guarantee that you have the right view.

Outcomes:

- Project documentation analyzed.

Adaptation tips:

- Even though you are familiar with the documentation, now is the time to analyze with an independent look.

Performers: Researcher

2.8 Plan Reflection

Description

Goal:

- Plan reflection based on the project actuality findings.

Income:

- Previous Notes, tapes, memos, discourse, context, circumstance, situation, actions and problems documented;
- Project Actuality findings that came together up to this moment;
- Problem Backlog revised.

Exit Criteria: Reflections planed.

Steps:

- Analyze all the causalities in the problem backlog and suggest action strategies to be discussed;
- For each conflicts, problems or singularities establish questions to help and to stimulate reflections;
- Use theory on project management, agile methods, maturity models do draw strategies and questions to be discussed. Other theories must be included, if the problem is related to other areas of interest.;
- Revise Project actuality findings, make sure you do not miss the real problems;
- Add any other challenge, pointed by others researchers to the problem backlog;
- Present and discuss problem backlog to a few leaders in order to stablish a priority on the reflection;
- Plan the meeting. Make sure that everyone that can make a difference will attend to the research planning meeting. Invite specialist if he can help in a specific problem;
    - The discussion usually takes time. Our experience suggests from 1,5 hours to 2 hours meeting.
- Book the meeting with project manager, scrum masters and organizational leaders. You do not want to lose the opportunity to get everyone you need involved.

Outcomes:

- Problem backlog revised with questions to be carried during reflections;
- Theory studied;
- Moderator assigned;
- Reflections meetings booked.

Adaptation tips: This second part of the approach (team reflection) is for those who wants to reflect about the findings. The best choice is to use organizational meeting to help the reflection. However, the reflections take time and you will probably need two hours. Plan wisely.

Performers: Researcher

2.9 Engage In Reflection

Description

Goal:

- Conduct active interview or participant observation to get those who are being researched to play an active role in the process, rather the being passive subjects (Cicmil,2006).
- Help team to **engage in reflection** about the best way to overcome a problem, a conflict or an improvement opportunity;
- Give team theory support on the reflections.

Income:

- Opportunity identified;
- Problem backlog revised with questions to be carried during reflections;
- Theory studied;
- Moderator assigned;
- Reflections meetings booked.

Exit Criteria: Project Reflection and actions idealized.

Steps:

- For every identified problem, conflict, singularities that was prioritized, ask how can they overcome such problem, or how could it be done in a different way;
- Evolve around questions (Cicmil,2006), such as How, When and Why;
- Use a data collection method known as 'active interviewing' (Cicmil et al.,2006), (Cicmil,2006);
- Use project management theory to endorse and support reflections;
- Consider project actors researchers in action who must continuously question their actions and intentions in light of real-world situations (Crawford,2006);
- Stimulate reflection, invite them to challenge the status quo;
- Talk about the identified problem, conflict, singularities. Ask how can they overcome such problem, or how could it be done in a different way;
- Document findings. Always take notes, the quote spoken, the actor involved, the situation it came out and context it occurred;

Outcomes:

- Data collected;
- Identified actions from project rethinking and reflection;
- Detailed records of the field work-interviews CICMIL (2006).

Adaptation tips: This second part of the approach is for those who wants to reflect about the findings. Although it is optional, it is strongly recommended. It helps to decided what to do with the project analysis.

Performers: Moderator

2.10 Document Memo

Description

Goal:

- Take filed notes from interviews and observation (Avram,2008; Lalonde et al, 2010; Adolph et al., 2011; Lalonde et al, 2010; Maaninen-Olsson and Mullern, 2009) Field notes include some discussion of context, which should be limited to that necessary for the reader to interpret the action.

Income:

- Observations and Interviews field notes.

Exit Criteria: Data and knowledge from interviews and observations documented.

Steps:

- Keep diary and take detailed field notes on every day spent in the field. Descriptions on every scenery, motivation, cultural must be transformed in a generous description.
    - Filed notes include some discussion of context, which has been limited to that necessary for the reader to interpret the action.
- Document the speech, to establish that the contents accurately reflect 'a reality that exists independently of any individual observer, interpreter or writer' (Hodgson and Cicmil, 2007);
- Write memos (Avram,2008), (Lalonde et al, 2010). Throughout the process, the researcher writes memos, capturing his or her thoughts that support the emerging concepts, categories and their relationships;
- Organize them by date;
- New data is constantly compared against previously observed data and concepts.

Outcome: Previous Notes, tapes, discourse, context, circumstance, situation, actions, problems documented.

Obs:

- This is a continuum activity. It is parallel to all the others. It does not mean that the data will only be documented at this moment;
- Memos may not contribute to the theory but they captured interesting insights that emerged from the data (Adolph et al., 2011).

Adaptation Tips: In order to be able to analyze the data, this step is mandatory. Although new forms of documentation can be used.

Performers: Researcher

2.11 Analyze Results

Description

Goal:

- Analyze field notes;
- Go beyond a description of particular occurrences to identify the patterns that occur, and thence model the ongoing inquiry process through which project actors tackle project situations (Lalonde et al, 2010).

Income:

- Data field and memos analyzed.

Exit Criteria: Field notes analyzed.

Steps:

- Look for causalities on each problem, aspect and issue identified. Tools such as ATLAS.Ti can help with data organization and analysis;
- Revise data to include new meanings by coding the data. Include colors, codes anything that will help identify the causalities along the research;
- Explore meaning and actions in the data by looking for similarities and differences within and between interview transcripts and observation field notes (Adolph et al., 2011);
- Go beyond a description of particular occurrences to identify the patterns that occur, and thence model the ongoing inquiry process through which project actors tackle project situations (Lalonde, 2012);
- Do not wait more than a few days to analyze the data already documented;
- Compare new data constantly against previously observed data and concepts (Adolph et al., 2011);
- By interpreting the empirical material gathered in the process of prolonged active interviewing and collaborative participative interpretation of accounts reflecting experiences of project practitioners, we can generate alternative understandings of what goes on in project practice (Cicmil,2006).

Outcomes:

- Project documentation analyzed;
- Causalities and relations among data collected created.

Obs:

- This step must be continuum and every new code, information or documentation must start it;
- If some theory is guiding the research, also synthesize a gap analysis each proposition or theory.

Adaptation tips: This is a mandatory activity. The main objective of the approach is to be able to analyze project and teams' actuality. Use inside meetings to confirm some analyzed ideas.

Performers: Researcher

D

Dimensions Analysis Example (F)

Dimensions and its Factors		Considerations	Evidences	F 1	F 2
Organization	Governa-mental Pressure	Although the govern did not pressure the business operation, it interfered with bad politics and lack of actions. Part of this phenomenon was translated in Figure "Govern as a external disturbing factor". In the feedback section, it was said that due to the bad political moment that Brazil is going through there was a client loss (PD 57:12) and an lower demand for projects (57:13)	PD17:5, 20:3, 25:12, 57:2, 57:8, 56:1, 58:1, 59:1, 26:6 and 28:3.	1	1
	Market Pressure	There was no market pressure, we got an affirmation for that and all the moments observed supported the affirmation. Only once it was commented that "In our market people do not know to position."(PD 20:9), regarding some opportunities lost for a much lower price. But they were not worried about it.	PD 20:6	0	0
	Customer Pressure	A few calls emerged during meetings. Once the programmer that is a partner said "The Po must follow the guidance we are trying to pass, not answering the phone in the meetings."(PD 53:1). If was not for the calls, the research does not present findings to consider it pressure.	PD 53:1	F	0
Team	Cohesion	H1 was cohesive, although H2 lack of it. The PO was closer and the an official SCM, later on turned officially into SCM, was the glue to the team. They had common goals.	H1 (PD 25:5, 28:17, 28:20, 30:1, 33:1)	2	0
	Customer Pressure	There was some pressure over the team H1, and it was seen in the indicators week after week, since they were always doing unplanned items. Although it was not in Altas.Ti, the excel for each week shows this scope changes. H2 suffers less only with a feel phone call though the PO.	H2 (PD 30:2, PD 31:1)	2	1
	Leadership	Both team had good leaders. Although H1 had a strong influence on the team.	H1 (PD 7:3, 8:4, 9:4, 9:6, 19:8, 21:1, 22:25, 24:4, 30:7) H2 (PD 6:5, PD11:1)	2	1
	Owner-Interventions	The pressure was mostly on the designer by the Po from H1. Although, the PO's lack of time generated lack of backlog and tasks.	H2 (PD 24:5, 24:6, 13:2, 20:1, 52:8, 19:20, 28:9, 33:8, 19:14)	0	0
Project	Management Pressure	The pressure was mostly on the designer by the Po from H1. We have only to entrances, but this was also seen in the meetings.	H2 (PD 24:5, 24:6)	0	1
	PM Effective-ness	There were many practices been carried with effectiveness. The PMBOK and MR-MPS adherence presents it. Just a feels quotations were chosen to point maturity manager.	PD 10:1, 13:5, 15:5, 20:4, 22:16, 30:2	1	1
Individuals	Individual Motivation	The organization paid for courses that only team H1 was doing. And those courses motivated the team. Commitment was seen as a motivation reaction.	H1 (PD 4:13, 19:2, 22:2)	2	1
	Outside life Interven-tions	The tester was a musician and was getting late due to that. Besides the H1's PO had an old father that was needing him with frequency. All entrances are related to the test getting late on Fridays. Usually interfering with Team H2 agenda.	PD 21:6, 22:34, 30:13, 31:9	2	2
	Additional Responsibi-lity	The programmer that was also a partner had activities related to configuration management for both teams. These activities occasionally generated some impact on his team.	PD 16:3, 35:3, 26:4, 29:4	0	1
	Proactivity	The proactive was seen in the beginning only by H1. Although it was strong in H2 after the intervention. Once we reflect about what should be done, references and theories, the scrum master would come out with an example or would start immediately the actions.	H1(PD22:10, PD28:15) H2(PD 24:7, 29:5, 30:12, 33:6)	2	1